Canadian minerals yearbook : review and outlook

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1998 1997 1996 1995 1994

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General Review

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OVERVIEW

The global economic environment improved during 1999 as the economic recovery finally got under way in Asia and Europe while Canada and the United States continued to experience strong economic growth. The expanding global economy led to an increase in most commodity prices in 1999 and an improved outlook for 2000. The price of most metals increased during 1999 and this was evident in the mining industry as operating profits rose, the decline in exploration spending moderated, and the value of non-fuel mineral production stabilized. However, there was a net decline in mining employment, and mine closures outnumbered openings as the industry continues to improve efficiency.

Canada's real Gross Domestic Product (GDP) at market prices rose by 4.5% to $880.3 billion in 1999, a significant increase from $842.0 billion in 1998 and a further increase from $815.0 billion in 1997. Both interest rates and inflation rates remained low and employment growth brought the unemployment rate down to 6.8% by the end of 1999. The Canadian dollar increased by three cents against the U.S. dollar from the beginning of the year to end the year at $0.68. Despite this appreciation, Canadian export sales increased to $360.6 billion in 1999 from $322.5 billion in 1998.

Preliminary estimates of the value of production for all sectors of the mining and fuel extraction industry showed a dramatic increase of almost 21% from $44.3 billion in 1998 to $53.5 billion in 1999. This is the highest value ever attained for Canadian mineral production. The increase is directly attributable to substantial gains in the value of crude oil and natural gas produced and to the emergence of Canada's diamond mining industry. When fuels are excluded, the value of production for the mineral industry increased by less than 1% to $17.0 billion. Of this, the value of metals production fell by 6.1% while nonmetals increased by 17.0% and structural materials increased by 4.1%.

The value of mineral and mineral product domestic exports (including fuels) increased to $71.3 billion in 1999 from $68.4 billion in 1998, a 4.3% rise. Improving commodity prices contributed significantly to the increase in the value of exports. Despite a general increase in exports, the export of primary products produced by the extraction, production or harvesting of minerals suffered the greatest decrease. The value of fabricated metal product exports increased by over 9.0% in 1999 to $13.1 billion as exports of these products to the booming U.S. economy rose significantly. In spite of an increase in mineral product imports, the trade surplus (total exports less total imports) in these products stood at a healthy $17.2 billion.

Prices for most major mineral commodities increased throughout 1999, bolstered by a recovering global economy. In some cases, such as copper, the price increased from US$0.65/lb to over US$0.80/lb during 1999 as greater demand offset higher production. The impact on nickel was also dramatic as the spot price more than doubled from US$1.81/lb to US$3.83/lb by the end of the year. Higher commodity prices are improving the outlook for Canadian mines and some expansion is expected over the next two years.

Significant developments affecting the Canadian mineral industry in 1999 included:

- increasing commodity prices;
- improving balance sheets for many companies;
- increasing activity in Canada's diamond industry;
- the continuing impasse at the Voisey's Bay nickel development;
- major capital expenditures in the iron ore industry;
- a more moderate decline in exploration activities;
- more mine closings than mine openings; and
- a fall in direct mine employment.

Outlook and Impacts on the Canadian Mining Industry

The year 2000 should see an improvement in the Canadian mining industry. The worst seems to be over as a strong global economy bolsters mineral commodity prices. Positive GDP growth is expected in most Asian countries in 2000 and for several Latin American countries as well. The gold market is showing more stability since the European central banks decided to limit gold sales over the next four years and the International Monetary Fund is looking for a means, other than gold sales, to provide debt relief for poorer countries. Despite a small increase in industrial activity, primarily in Japan, the price of high-grade metallurgical coal could decrease slightly in 2000 as purchasers hold out for a reduction in prices. Although most Canadian mining companies have reduced costs, operating profits are low and many have high debt leverage. This debt creates the possibility for mergers and acquisitions that should make the highly fragmented mining industry more attractive to investors. As well, particularly for nickel, copper and gold, new low-cost additions to mine supply are coming on stream in other countries. These factors will intensify pressure on the ability of higher-cost, older mines to remain operational in 2000.

There are, however, some positive signs. Based on company spending intentions at the end of 1999, exploration expenditures in 2000 in Canada are expected to level off at $502 million after dropping to $501 million in 1999 from $666 million in 1998. Low commodity prices have caused many companies to curtail or suspend exploration, although the recent turnaround of some metal prices may benefit exploration spending. On the Toronto Stock Exchange (TSE), the world's leading stock exchange for raising equity capital for mining companies, the nearly 300 mining companies listed had a market capitalization of $80 billion in 1999, a 21% increase over 1998. There have also been a few significant mineral discoveries in Canada and elsewhere that have revived investor interest.

CANADIAN ECONOMY

Ongoing low and stable inflation rates, low interest rates and increasing employment led to another strong performance by the Canadian economy in 1999. Inflation averaged just 1.7% for the year. Interest rates were lower during 1999 and remain low by recent historical standards. The Bank of Canada lowered its rate by 25 basis points in March and then by another 25 points in May. After that time, two successive 25-point increases brought the Bank of Canada rate to 5.25% in February 2000, returning it to the same level it started at in 1999. Consumer confidence and spending increased during 1999. Canada Mortgage and Housing Corporation announced that housing starts climbed to about 150 000 units, an increase of 9% from 1998. Housing sales were also up by about 7% to an estimated 335 735 units. Sales of new cars and trucks increased to more than 1.5 million units, an 8% increase over 1998.

CANADIAN ECONOMIC CONDITIONS

Leading Indicators	1998	1999	% Change
Real GDP ($ billion)	842.0	880.3	+4.5
Consumer prices (% annual change)	+0.9	+1.7	n.a.
Operating profits ($ millions)	132.0	158.1	+19.8
Unemployment rate (% annual average)	8.3	7.6	-8.4
Merchandise trade balance ($ billion)	19.1	33.8	n.a.
Housing starts (000)	137.4	150.7	+9.1
U.S. exchange rate (annual average)	0.6741	0.6731	-0.15
International current account deficit ($ millions)	-16 255	-3 447	n.a.
Global economic output (% change)	+2.5	+3.3	n.a.

Source: Natural Resources Canada.
n.a. Not applicable.

The unemployment rate fell to 6.8% in December from 7.9% in January. Manitoba had the lowest rate at 5.6% and Newfoundland the highest at 16.9%. Employment grew by an impressive 3.0% as an estimated 427 000 new jobs were created in 1999. In terms of real GDP growth, the Canadian economy was the best performer among the G7 countries in 1999, surpassing even the United States.

On the trade front, total merchandise exports have increased steadily over the last several years, reaching $360.6 billion in 1999. Despite an increase in imports, Canada's trade surplus climbed to $33.8 billion from $19.1 billion in 1998 and $23.8 billion in 1997. As a result of the improved trade surplus, Canada's overall international current account deficit declined in 1999 to $3.4 billion, an improvement from the 1998 deficit of $16.3 billion. Since 1982, the current account has only had a surplus in 1982 and 1996. At year-end, the dollar was trading at 67.9 cents in U.S. funds, down from a high of 68.4 cents earlier in the year. For much of the last half of 1999 and early in 2000, the dollar traded at about 68 cents.

World economic growth was a robust 3.3% in 1999 and is expected to reach 4.2% in 2000 with economic expansion continuing in the United States, Latin America and Asia, including moderate growth in Japan. Korea, India and China had strong growth in 1999 that should continue into 2000. The European Union had economic growth of 2.3% in 1999 that

could rise to 3.2% in 2000, and positive growth is improving the economies of emerging European countries such as Russia and Poland. The coincident increase in economic growth among these regions could lead to a further rise in some non-fuel commodity prices.

CANADIAN MINERAL INDUSTRY, 1999

The Canadian mineral industry can be characterized by the following four stages of processing activity:

- Stage 1: Primary Mineral Production (mining, including quarries and sand pits, and concentrating);
- Stage 2: Metal Production (smelting and refining);
- Stage 3: Minerals and Metals-Based Semi-Fabricating Industries; and
- Stage 4: Metals Fabricating Industries.

While much of the emphasis of this article focuses on Stage 1 activities (the activities of the mining industry), a description of the mineral industry as a whole (Stages 1 to 4) provides a more comprehensive picture of the overall importance of the mining industry to Canada. In the context of this article, the mineral industry should be taken to exclude the extraction and processing of crude petroleum and natural gas, but to include both the coal and uranium mining industries.

Leading Mining Indicators	1998	1999	% Change
Value of non-fuel mineral production (with coal) ($ millions)	18 742	18 528	-1.14
Exploration expenditures ($ millions)	655.9	501.1	-24
Metal Prices Index (1992=100)			
Precious metals	90.7	86.0	n.a.
Base metals	89.7	92.5	n.a.
Direct mining employment (000)	54.9	52.3	-4.7
Value of mineral and mineral product exports including coal ($ billions)	45.3	44.0	-2.9
Mining company profits – metals sector ($ billions)	1.5	1.7	+15
Mine financing ($ billions)	3.2	1.8	-44

Source: Natural Resources Canada.
n.a. Not applicable.

GDP OF THE MINERAL INDUSTRY

In 1999, the mineral industry, as defined above, contributed $27.7 billion to Canada's total GDP of $750.0 billion. (In this section, all figures are based on GDP at factor cost and at 1992 prices.) The mineral industry, therefore, accounted for 3.7% of the total, the same proportion as in 1998. The 1999 estimate for the mineral industry was 2.3% above the 1998 level of $27.1 billion. Because these figures are based on 1992 prices, an increase in the value of production indicates an increase in the volume of goods produced. These proportions can be somewhat misleading, however, in that they are based on 1992 prices. Because current price data by industry are only available up to 1995, they do not reflect commodity prices as they were in 1999. Geographically, the importance of the industry is much more significant on a regional and community basis as, in many parts of Canada, particularly in the North, it provides the major economic stimulus. Some 150 communities were heavily reliant on mining in 1996 and approximately 700 000 Canadians lived in these communities.

The total GDP of all four stages of the mineral industry increased in 1999 compared to 1998. However, the GDP of the combined mining and quarry and sand pit industries declined to $7.5 billion from $7.7 billion in 1998 but still accounted for 27% of the mineral industry total. The combined GDP of Stages 2, 3 and 4 rose by 4.2% over 1998, reaching $20.2 billion.

CANADIAN MINERAL PRODUCTION

Preliminary estimates indicate that the total value of Canadian mineral production (including fuels) climbed to $53.5 billion in 1999, a 20.6% increase from the $44.3 billion recorded in 1998. The value of the fuels portion of the total increased by 33.1% due to a significant increase in the price of oil. The non-fuel portions of the total edged upward by 0.4% as an increase in the value of the nonmetallic group offset a decline in the value of metallic mineral production (see table below).

CANADIAN MINERAL INDUSTRY VALUE OF PRODUCTION 1998 AND 1999

	1998r	1999p	Change
	($ millions)		(%)
Metals	10 450.2	9 808.7	-6.1
Nonmetals	3 425.5	4 007.8	17.0
Structural materials	3 101.7	3 227.4	4.1
Total nonfuels	16 977.4	17 043.9	0.4
Fuels	27 361.5	36 422.1	33.1
Total	44 338.9	53 466.0	20.6

Sources: Natural Resources Canada; Statistics Canada, *Canada's Mineral Production, Preliminary Estimates*, cat. no. 26-202-XIB.
p Preliminary; r Revised.
Note: Numbers may not add to totals due to rounding.

Table 1 presents commodity-specific production data for Canada's leading minerals. While there were exceptions, most of the major commodities suffered declines in production and in the value of production in 1999 relative to 1998. The value of metal production declined to $9.8 billion from $10.5 billion, a decrease of 6.1%, due mainly to sharp drops in the value of production of copper (-19.7%), iron ore (-13.8%), gold (-7.8%), and cobalt (-28.1%). The volume of nickel, platinum group metals and zinc produced declined by 10.5%, 10.1% and 3.2%, respectively, but the value increased as prices began to rise. Platinum group metals benefited from higher prices as the value of production rose by 6.3% despite the 10.1% decrease in production. The decline in the value of metals production, caused principally by falling prices, was offset by gains in the value of nonmetals and structural materials. Both experienced solid gains in 1999, reflecting strong economic conditions in North American markets and the first full year of production at Canada's first diamond mine.

Nonmetals increased by $582 million, or 17.0%, to $4.0 billion, and structural materials increased by $126 million, or 4.1%, to more than $3.2 billion. Almost all of the increase in nonmetals can be attributed to the rise in value of diamond production to $582 million from $41 million in 1998. The value of potash increased by 1.6% despite a 6.1% decrease in production from 1998. In 1999, the value of production of elemental sulphur increased 30.0% to $80.7 million despite a modest 4.6% increase in the volume produced. The value of sulphur in smelter gas also increased by 13.8%. Gypsum registered gains in both the value and volume of production.

The value of production of structural materials rose, due primarily to higher values for cement, lime and clay. The value of cement rose by 7.3%, lime by 9.6%, and clay by 22.0%.

The value of production of mineral fuels increased sharply in 1999 from $27.4 billion in 1998 to $36.4 billion in 1999, a rise of 33.1%. Of the components within the mineral fuel group, only natural gas experienced an increase in the volume of production (up 1.8%). Higher prices for crude petroleum and natural gas by-products resulted in significant increases in the value of production of these commodities (up 46.0% and 33.1%, respectively), even though the volume produced declined for both. The value of coal production declined by 4.0% and the volume by 15.9%.

Based on the value of output in 1999, the top non-fuel commodities were gold ($2.1 billion), potash ($1.8 billion), nickel ($1.6 billion), zinc ($1.5 billion), iron ore ($1.4 billion), copper ($1.4 billion) and cement ($1.2 billion). In terms of the production of some of Canada's leading minerals, increases in output volumes in excess of 5% were recorded for diamonds, peat, asbestos and gypsum, whereas declines in excess of 5% were experienced by nickel, iron ore, copper, platinum group metals, cobalt and molybdenum.

Regionally, four provinces again dominated the value of Canada's non-fuel mineral production during 1999. Ontario contributed the largest share of the non-fuel mineral output, accounting for 29.5% of the total value. Quebec contributed 20.7%, Saskatchewan 13.5%, British Columbia 9.9%, Newfoundland 5.6%, New Brunswick 4.9%, and Manitoba 4.7% to Canada's total. The remaining provinces and territories accounted for 11.3% of the total. The value for Ontario increased slightly to $5.0 billion, Quebec decreased very slightly to $3.5 billion, Saskatchewan increased minimally to $2.4 billion, and British Columbia declined by 13.1% to $1.7 billion. When coal is included, the value of British Columbia's production climbs to $2.5 billion and Saskatchewan's value remains at $2.4 billion.

Alberta remained Canada's major mineral fuels producer, accounting for 77.9% of the total value in 1999. Alberta also has significant volumes of all the components of the mineral fuels: crude petroleum, coal, natural gas, and natural gas by-products. Other provinces with significant mineral fuel components are Saskatchewan with 10.2% and British Columbia with 7.5% of Canada's total. Crude petroleum production from Hibernia boosted Newfoundland's contribution to the value of Canada's mineral fuel production to 2.7%. Other provinces and territories accounted for the remaining 1.7%.

Of the 10 mine openings in 1999, 3 were in Quebec, 2 each in Saskatchewan and British Columbia, and 1 in each of Newfoundland, Ontario and the Northwest Territories. Of the 23 closures recorded, 9 were in Ontario, 5 in Quebec, 4 in British Columbia, and 1 each in New Brunswick, the Northwest Territories, Nova Scotia, the Yukon and Saskatchewan.

METAL PRICES

Prices increased for most mineral commodities in 1999 in reaction to strengthening global demand conditions, particularly in the Far East where economic growth improved in major mineral-consuming countries. Moreover, some growth was experienced in Latin American countries and more is expected in 2000. Overall, the Eastern European countries' GDP grew by over 1% during 1999 and the Russian economy grew by a surprisingly strong 3.2%. Major base-metal prices exhibited a steady increase throughout the year with the exception of lead. In December, copper, aluminum, nickel and zinc spot prices were at their trading highs for the year. For copper, inventories were up to their highest levels in nearly six years in early 1999, but the price increased to US$0.78/lb

by year-end as stocks were reduced due to increased consumption. Aluminum climbed from US$0.54/lb in the first quarter to US$0.68/lb in the fourth quarter, although total stocks were down only slightly. Nickel prices rose significantly throughout the year from US$1.69/lb in mid-December 1998 to US$3.83/lb at the end of 1999, an increase of over 100%. Similar to aluminum, nickel inventories finished the year down moderately from last year. Zinc inventories declined during the year, helping to raise the annual average price to US$0.49/lb from US$0.46/lb in 1998. An 85% increase in the inventories of lead lowered the annual average price of lead to US$0.23/lb, down 1 cent from 1998.

For precious metals, the price of gold finished 1999 at an average of US$279/oz, down 5% from the previous year. However, during the year, the price of gold plunged to US$253/oz with the threat of central bank sales and soared later in the year to US$325/oz on the news that European central banks had agreed to limit the sales of gold from official reserves. Jewellery and industrial demand were up slightly from 1998 as demand increased over 15% in the Middle East. Silver had an annual average price of US$5.25/oz, down from the 1998 average of US$5.53/oz as above-ground stocks were used to make up the demand not met by mine production and recycled scrap. The rising demand for platinum was driven by jewellery fabrication, especially from China. The price increase for platinum through 1999 led to a small increase in its average price from US$372 per troy ounce in 1998 to US$377/oz in 1999. Palladium finished the year with an average price of US$361/oz, up 47% from last year as demand continues to escalate while it is being substituted for platinum in autocatalysts. Both metals were significantly affected by ongoing production and export supply uncertainties in Russia, which is the world's largest palladium exporter and the second largest platinum exporter. The price of cobalt increased by over 50% during the year to US$17.02/lb, molybdenum increased slightly to US$2.59/lb, and uranium declined about one third to US$9.00/lb. For iron ore and coal, where prices are largely determined by benchmark international contracts, iron ore prices were up by over 5% whereas metallurgical coal prices were off by more than 20% to US$41/t in 1999. Sulphur prices increased about 40% in 1999 to US$37/t after dropping 35% in 1998. Potash prices were up about 2% during 1999.

Reserves

Canadian reserves of copper, molybdenum, lead, zinc, silver and gold decreased significantly during 1998 and only nickel reserves increased. Ore reserves were reduced at many operations because reserve calculations were done using lower metal prices at the end of 1998. Lower metal prices reduce the level of reserves because lower-grade ores become uneconomical to mine and are removed from reserves. Production is normally the main factor reducing the reserves at individual mines, but in 1998 declining metal prices were a significant factor. Canadian reserves of copper, nickel, lead, zinc, molybdenum and silver have declined steadily since the early 1980s, and gold began a gradual decline in 1988. The closure of mines during 1999 will likely reduce reserves, but higher prices for some metals should help offset the decline.

Employment in the Mineral Industry

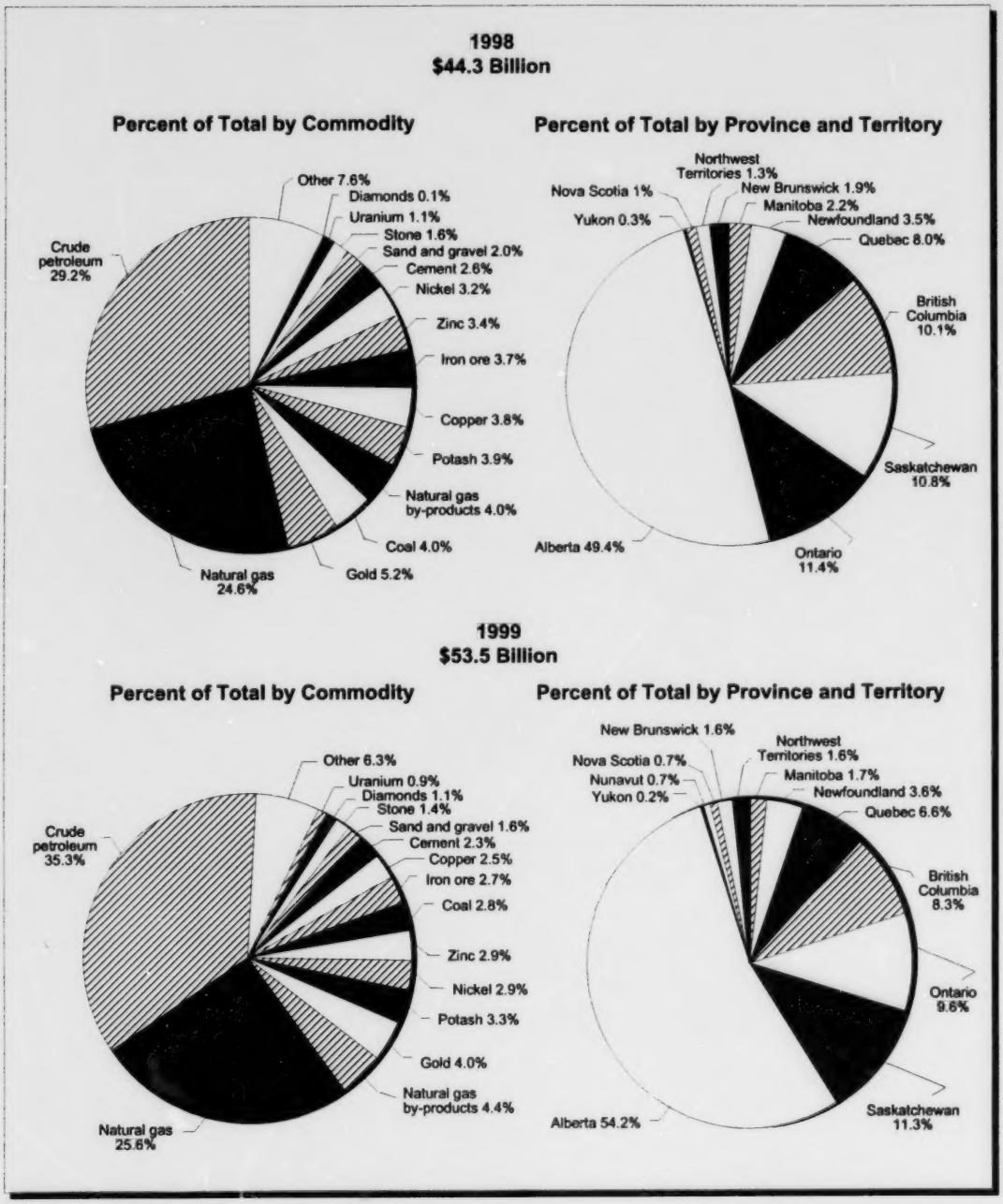
Combined employment in the four stages of the mineral industry (including coal mining) is estimated to have reached 386 000 in 1999, 1.8% above the revised 1998 level of 379 300. The mineral industry thus accounted for 2.7% of the national employment level of 14.5 million in 1999.

While total mineral industry employment grew, employment in Stage 1 (metal, nonmetal and coal mining, and quarries and sand pits) declined for the fourth straight year in 1999. Stage 1 employment was estimated at 52 300 in 1999, a 4.7% decline compared to 1998. Both metal mining and coal mining experienced declines in employment in 1999 while nonmetal mines saw a modest increase. Mine closures and suspensions due to weak commodity prices, coupled with the necessity to reduce costs and improve efficiencies, led to the declines. Buoyed by the robust North American construction industry, the structural materials sector experienced an increase in its level of employment in 1999 (up 5.1% to 7845).

Employment levels for Stages 2, 3 and 4 were all higher in 1999 compared to the previous year. Employment increased in Stage 2 by 0.5% to 60 000, in Stage 3 by 1.4% to 97 000, and in Stage 4 by 4.5% to 176 700. The strong North American economies are boosting these sectors.

Reduced activity in Stage 1 affected the level of employment in the sector that provides services incidental to mining and quarrying. This sector provides drilling services, conducts exploration and provides other services. In 1999 the number employed in the sector declined by almost 8% to 8633. This figure includes 1569 in the mining diamond drilling sector. Because there is no establishment-based survey undertaken at this time either by Natural Resources Canada or by Statistics Canada for Services Incidental to Mining, these numbers should be viewed with caution.

Figure 1
Value of Mineral Production, Percent Shares by Commodity and by Province and Territory, 1998 and 1999



Sources: Natural Resources Canada; Statistics Canada.

Notes: The provincial shares may not add to 100% due to rounding. Prince Edward Island's share is excluded as it is too small to be expressed.

MINERAL INDUSTRY TRADE

Canada is one of the world's largest exporters of minerals and metals, and the export of these commodities and more refined mineral products has a significant impact on Canada's overall merchandise balance of trade surplus and, hence, on the national standard of living. The United States was by far the primary recipient of Canada's mineral and mineral (non-fuel) product exports in 1999, receiving 78.8% of domestic exports. The European Union (7.6%) and Japan (4.4%) followed. The relative strength of the U.S. economy resulted in an even higher proportion of Canada's mineral industry exports being directed to the United States. In 1998, the proportion received by the United States was 74.9% (refer to the chapter entitled "Statistical Report").

In 1999, the value of domestic exports of minerals and mineral products, including fuels, increased by 4.3% to $71.3 billion from $68.4 billion in 1998 (Table 2). An increase in the export value of mineral fuels more than offset a decline in the value of metals and metal products. Commodities produced in Stages 3 and 4 accounted for the gains. Metals and metal products contributed 47.0% to total mineral product exports; mineral fuels, 41.1%; nonmetals, 10.3%; and structural materials, 1.6%. Together these products accounted for 21.6% of the value of Canada's total domestic merchandise exports of $330.4 billion.

The total value of metallic minerals and mineral product domestic exports decreased to $33.5 billion in 1999, a drop of 3.6% from 1998. The value of domestic exports of Stage 1 metallic commodities declined by 18.2% to $3.2 billion. For individual commodities within the total metallic minerals sector, exports rose for zinc (2.3%), iron and steel (2.0%) and aluminum (1.3%); exports declined for gold (-16.9%), copper (-18.1%), iron ore (-18.4%), nickel (-12.0%), uranium (-10.9%) and cobalt (-37.5%). Two commodities, iron and steel and aluminum, accounted for over half of the total value of exports in the metallic mineral and mineral products sector. Other major contributors were gold, copper, nickel, zinc and iron ore.

The value of domestic exports of nonmetallic minerals and mineral products increased in 1999, up 4.2% to $7.4 billion. Gains in the value of exports of gypsum (35.1%), glass and glassware (13.6%), nitrogen (10.2%), and potash and potassium compounds (6.6%) offset declines in chlorine (-25.7%), sulphur and sulphur compounds (-14.4%), and salt and sodium compounds (-9.3%). Sulphur exports would have decreased further except that shipments to China increased by 144%. Potash (including potassium products) is the major component in the nonmetals sector, accounting in 1999 for 28.7% of the value of total nonmetallic exports.

The value of structural material domestic exports increased significantly in 1999, rising 15.6% to $1.1 billion, led by the largest component of this group, cement (17.0%). Other commodities experiencing gains were clay and clay products, granite, slate, sand and gravel, marble, dolomite and other structural materials. The value of exports of limestone flux and other limestone, lime and sandstone declined in 1999.

An increase in the value of domestic exports of petroleum (due to sharply higher crude oil prices in 1999) and the value of natural gas exports offset a decline in the value of coal and coke exports (-19.4%). This resulted in an increase in the value of mineral fuel exports to $29.3 billion, a 14.6% increase from the 1998 level of $25.6 billion. More than half of the value of mineral fuel exports is accounted for by petroleum. In 1999, the value of petroleum exports increased by 16.1% to $15.0 billion. The value of natural gas exports also increased by more than $2.1 billion to $11.0 billion.

The value of imports of mineral products, including fuels, increased by 2.9% from $53.7 billion in 1998 to $55.3 billion in 1999 (Table 2). The value of imports of all the non-fuel sectors rose, offsetting decreases in the value of imported coal and coke products and natural gas. The value of imports of the metals and metal products sector rose slightly to $36.2 billion from $36.0 billion in 1998. As with exports, iron and steel and aluminum are the two largest components of metal product imports comprising 55.0% of the total. Metallic minerals and products accounted for two thirds of the value of total mineral product imports in 1999, nonmetallic mineral products for 11.2%, structural materials for 2.5%, and mineral fuels for 20.9%. When fuels are excluded, mineral industry imports (including coal) totaled $44.9 billion, 14.0% of total merchandise imports in 1999.

As a result of the slight decrease in the level of non-fuel minerals and mineral product exports (including coal) and higher levels of imports, the balance of trade surplus for these commodities declined to $0.2 billion in 1999 from $2.2 billion in 1998. For the total economy, Canada's merchandise trade surplus increased to a substantial $34.2 billion in 1999 from $20.0 billion in 1998 as the increased value of exports offset the smaller rise in the value of imports.

INVESTMENT BY THE MINERAL INDUSTRY

Information on exploration expenditures and capital spending provides a useful indication of market conditions and of the views management and investors in the Canadian mining industry hold on future market conditions in relation to present productive

capacity. In 1999, almost 300 mining companies were listed on the TSE with a market capitalization of $80 billion compared to approximately $65 billion in 1998.

Exploration Expenditures

Final exploration figures for 1998 show that exploration and deposit appraisal expenditures totaled $655.9 million compared to $921.0 million in 1997. Preliminary estimates for 1999 indicate that the level of non-fuel exploration and deposit appraisal field expenditures show an additional decline to $501.1 million. Company spending intentions for 2000 of $502.1 million indicate that the decline in activity may be leveling off. An expected increase in expenditures on the search for diamonds should offset the expected decline in the search for metals. Lower prices for some metals and lower investor interest in mineral exploration activities are the primary causes for this decreased exploration spending.

All provinces and territories experienced declines in exploration expenditures in 1999. Particularly hard-hit regions were Saskatchewan, Ontario and Alberta.

Mine complex development expenditures, which went from $866 million in 1997 to $966 million in 1998, are expected to decrease to $763 million in 1999 and to $735 million in 2000.

The level of mineral exploration activity is closely linked to mineral commodity prices, so it is not unexpected that exploration expenditures declined in 1999. When commodity prices show signs of strength, the mineral exploration industry can be expected to respond.

Capital Investment

Capital expenditures for construction and materials and equipment in the mining and mineral processing industries are expected to reach $6.3 billion in 2000, up from an estimated $5.8 billion in 1999 and the $6.2 billion recorded in 1998. While the overall numbers for the mineral industry are relatively strong (levels for 1996 and 1997 were $5.3 billion and $6.7 billion, respectively), the performance of the different sectors within the mineral industry vary markedly. Capital expenditures for the mining and quarrying industry (Stage 1) were estimated to be $1.9 billion in 1999, down 28.0% from $2.6 billion in 1998. A slight increase of 3.7% to $2.0 billion is anticipated for 2000. Capital investments in the primary metal and nonmetallic mineral semi-fabricating industries (Stages 2 and 3) are expected to increase between 1998 and 2000, buoyed by the strong North American economy. In 2000, investment is expected to reach $3.6 billion, up from the $3.3 billion recorded in 1999 and the $2.7 billion estimated for 1998. Investments in Stage 4 industries are expected to fluctuate from $872.1 million in 1998 to $669.4 million in 1999 and to $727.3 million in 2000.

In 1998, capital investment in the total economy stood at $167.4 billion. Estimates indicate an increase to $174.3 billion in 1999 and $176.6 billion in 2000. In 1998, investments in the mineral industry (Stages 1 to 4) accounted for 3.7% of the total capital expenditures in the Canadian economy. This proportion declined in 1999 to 3.4% but should rebound to 3.6% in 2000. When repair expenditures to structures, machinery and equipment are included, expenditures in the mining and mineral processing industries totaled $10.8 billion in 1998, the latest year for which repair data are available. The 1998 level represented 5.2% of the total capital and repair expenditures within the Canadian economy. This indicates that in 1998 the mineral industry spent relatively more adding to existing plants, machinery and equipment than the economy as a whole.

Highlights in the Canadian Mining Industry

Profits by Canadian mining companies rebounded in 1999 chiefly due to a recovery in some commodity prices. For the year, operating profits for the metals sector were up by 15% to $1.7 billion from $1.5 billion in 1998.

Canada's first diamond mine had its first full year of production in 1999. The Ekati diamond mine produced 2.4 million carats (Mct) with an estimated value of $582 million. It is currently forecast to produce between 3.5 and 4.5 Mct/y from five kimberlite pipes over a 25-year span, with revenues averaging $500 million per year, making it one of the 15 largest diamond mines in the world. The first Ekati diamonds offered for sale in Antwerp, Belgium, early in 1999 brought about US$125-US$130/ct, excluding the largest stones, which were to be sold later. As well, BHP Diamonds Inc. opened a diamond-sorting and valuation facility at Yellowknife and has indicated that it will sell a portion of its rough diamonds to cutting and polishing operations that become established in Canada, initially to those in the Northwest Territories.

A potential second diamond mine in the Northwest Territories continued to make progress towards development in 1999. The proposed Diavik mine, located some 35 km southeast of the Ekati mine, is owned 60% by Diavik Diamond Mines Inc., a wholly owned subsidiary of Rio Tinto plc, and 40% by Aber Resources Ltd. In November, Diavik Diamonds received approval for permitting and licensing from the Government of Canada for the proposed mining operation. The mine could be in production by the first half of 2003. Work to date has concentrated on the development of four kimberlite pipes for the pro-

posed Diavik mine. The current mineable reserve is estimated at 26 Mt grading an average of 3.9 ct/t with an estimated value of US$56/ct. Preliminary estimates put the capital costs of putting the mine into production at $1.3 billion. Year 2000 construction is an infrastructure establishment program to ready the site for major dike and plant construction in the following two years.

Noranda Inc. began production at the Bell Allard zinc mine near Matagami, Quebec, in August 1999 and reached commercial production of 65% of its designed operating capacity of 2000 t/d in January 2000. It was brought on stream at an estimated capital cost of $133 million. At the start of production, ore reserves stood at 3.2 Mt grading 13.8% zinc, 1.5% copper, 48 g/t silver and 0.68 g/t gold. Ore is processed at the company's concentrator in Matagami. The mine life is estimated at five years and planned zinc production is about 100 000 t/y. The mine was developed to replace the Isle Dieu and Norita East mines, both of which closed in 1997.

Canada's first phosphate mine began production in August 1999 at the Kapuskasing open-pit mine in Ontario. Agrium Inc. began developing the high-quality phosphate deposit in September 1997 at a cost of US$70 million. At the start of production, ore reserves were estimated at 22 Mt grading 38% P_2O_5. The phosphate rock mined is processed at the company's Redwater, Alberta plant, which was modified to process it into phosphate fertilizer. The high-grade, low-cost mine is expected to supply 100% of the phosphate rock required by the Redwater plant for approximately 20 years. The Redwater plant has an annual production capacity of 650 000 t of mono-ammonium phosphate (MAP). Procuring phosphate rock constitutes about 70% of the plant's production cost. The original Kapuskasing deposit was drilled in 1954 by Continental Copper as a base-metal project. The property was acquired by Agrium when it merged with Viridian Inc. in December 1996. Prior to the start of mining at Kapuskasing, Agrium relied on imported rock from Togo, Africa, since 1986.

The McArthur River uranium mine came into production in early December 1999 at McArthur River, Saskatchewan. Cameco Corporation owns a 69.8% controlling interest and is the mine's operator. COGEMA Resources Inc. owns the remaining 30.2%. Mine production is planned at 18 million lb U_3O_8 (6924 tU) annually. The mine was developed at a capital cost of $400 million. It is the world's largest and highest-grade uranium deposit. As of December 31, 1999, the overall reserves and resources outlined stood at 186 000 tU, with 98 000 tU currently in the mineable category. While the ore grade of ore reserves averages 14.7% U (17% U_3O_8), the resource grade averages 10.2% U (12.03% U_3O_8). There is significant potential to delineate additional reserves. Ore is processed at the Key Lake mill (located some 80 km southwest of the mine), which was revamped in June 1999 to handle blended ore grading 4% U_3O_8.

Production began at the McClean Lake uranium mine near McMahon Lake, Saskatchewan, on June 22, 1999, when stockpiled uranium ore from the JEB pit was fed into the McClean Lake mill and the first barrel of yellow cake was produced on July 12. It is the first Canadian, French and Japanese mining joint venture in Canada. COGEMA Resources Inc., the majority owner of the project, holds a 70% interest, Denison Mines Ltd. holds 22.5%, and OURD (Canada) Co., Ltd. holds 7.5%. The McClean Lake uranium deposit has overall mineable reserves of 17 300 tU. The designed open pit runs from 20-145 m in depth. Currently, the overall ore grade averages 2.7% with underground ore increasing to 4% at a depth of 170 m. The mine was developed at a capital cost of $200 million. The overall operation involves open pit at the Sue, A, B and C orebodies and underground at McClean. Production is planned at 6 million lb of U_3O_8 annually. Mill capacity may be expanded to mill ore from the Cigar Lake mine, which is scheduled to come on stream in 2002.

Since the discovery of extensive gold-silver-copper-zinc mineralization at depth, Agnico-Eagle Mines Limited has embarked on a shaft-sinking (Shaft No. 3) capacity expansion program to increase production at the LaRonde mine. In the Phase I expansion program, which started in 1997, the mine's ore capacity was increased from the original 1800 t/d to 3265 t/d in 1999, with production reaching capacity level in the first quarter of 2000. However, higher-than-expected ore thicknesses in zones accessible from Shaft No. 3 enabled the company to plan further expansion. A revised Phase II capital program was designed in 1999 to increase the ore capacity to 4535 t/d. Although the revised plan will require an extra US$34 million, increasing the total capital cost of the two-phase expansion program to US$218 million, the expansion is expected to result in a greater rate of return and a shorter payback period. About US$120 million of the US$218 million remains to be spent over the next 3.5 years. An expansion of the mill capacity to 4535 t/d is expected to be completed by the fourth quarter of 2000. At this rate, LaRonde's annual gold production is expected to triple to 337 000 oz in 2004 at a cash operating cost of US$104/oz, making the mine one of the lowest-cost gold mines in the world. Current mine reserves stand at 3 million oz with an additional 3.1 million oz in the mineral resource category. As major ore zones are opened at depth, there is good potential to further increase ore reserves.

In 1999, Goldcorp Inc. continued its drilling program at the Red Lake mine in Ontario for further definition of the High Grade Zone reserves. The development work being done will make the Red Lake mine one of the lowest-cost-per-ounce gold producers in the world.

Its cash production cost will drop from US$360/oz when it was last operating in 1996 to $88/oz when production begins in November 2000. In addition, its annual gold production will increase from 53 000 oz to 240 000 oz. The company also resolved its long-running labour dispute in April 2000 with the union recommending and approving its own de-certification.

In November 1998, the Iron Ore Company of Canada (IOC) announced a $344 million capital expenditure program, raising its six-year total expenditure program, which began in 1997, to $1.1 billion. The objective is to increase production capacity in the Labrador Trough area in order to produce higher-quality iron ore pellets and to increase production from 11 Mt in 1997 to 17 Mt/y by 2003. This latest announcement features the reactivation of the Sept-Îles pellet plant, mothballed in 1982, and includes upgrades of equipment at the Labrador City mine, the purchase of additional rail equipment, and an increase in hydroelectric capacity at its Sainte-Marguerite River generating facility near Sept-Îles. The reactivation of the Sept-Îles pellet plant will enable the company to process the much higher-quality concentrates that will be produced at Labrador City.

A positive feasibility study, completed in the third quarter of 1999, supported the expansion of the Niobec mine near Chicoutimi, Quebec, to capture the rising market for niobium. In 1998, Teck Corporation and Cambior inc. launched a $15.7 million capital program to deepen the mine shaft at the Niobec mine and to develop ore reserves in the lower or third block, which contains 7 Mt grading 0.73% Nb_2O_5, by developing a ramp and installing a new crusher. With the addition of these new reserves, total mine reserves now stand at 10.6 Mt grading 0.52% Nb_2O_5, sufficient to sustain the current production rate until the mid-2010s. Initial production from the first-phase expansion is expected to begin in the fourth quarter of 2000. The project will slowly ramp up, increasing capacity by 20% as the market warrants. A second-phase expansion, to begin at an unspecified date, will increase output by another 20%. Capital costs for the first-phase expansion will be $4.7 million and, for the second phase, less than $2 million. Production in 2000 is expected to total 2400 t of contained niobium, up from 2300 t in 1999 and 2177 t in 1998.

Construction will not be proceeding at Voisey's Bay in 2000 as talks between Inco Limited and the Government of Newfoundland and Labrador broke off in January 2000. It is uncertain when talks will resume. After six months of negotiations, the two parties could not agree on what facilities would be constructed for processing the ore. Inco has stated that the original plan is uneconomic and they cannot guarantee the construction of a commercial processing facility. They did, however, propose building a process research and development pilot facility. Inco outlined a project for developing the property that includes a 6000-t/d mine/mill operation at a cost of $750 million and a $95 million underground exploration program. Premier Brian Tobin stated that his position remains that the project will include the processing of nickel concentrate to a final nickel product in the province. The Voisey's Bay deposit could be among the lowest-cost nickel deposits in the world when production begins. In August 1999, Inco received approval of its Environmental Impact Statement for developing the deposit from the Canadian Environmental Assessment Agency.

Northgate Exploration Limited acquired the Kemess gold mine in British Columbia from the interim receiver for Royal Oak Mines Inc., which filed for bankruptcy in December 1999. Northgate will take over management of the mine and terminate the interim receiver. The Kemess mine is expected to produce 280 000 oz of gold and 55 million lb of copper annually at an expected operating cost of US$160/oz. It is the largest gold mine built in Canada during the last decade.

Government and Industry Initiatives

The Canadian government, through Natural Resources Canada, in conjunction with provincial governments and the mineral industry, has undertaken a wide variety of activities to promote and support Canada's minerals and metals industry and the mining-related equipment and services sector. These activities include a Minister-led mission to Asia (China, South Korea and Japan), cohosting the World Mines Ministries Forum as part of the Mining Millennium 2000 event in Toronto, and ministerial participation in GeoCanada 2000 in Calgary in May 2000. In addition, Natural Resources Canada officials, at seminars and conferences around the world and in Canada, have promoted Canada's geological potential and Canadian mineral properties, highlighted the competitiveness of Canada's minerals and metals industry, showcased new Canadian advances in mining, mineral processing and related technologies, and demonstrated to investors that Canada can supply a full range of equipment and services to the world's mining community.

The Government of Canada announced in August 1999 that it will invest $60 million over the next five years in GeoConnections, an initiative that will make geospatial data and innovation accessible to all Canadians through the Internet. GeoConnections will bring all of Canada's geographical data together on the Internet, which will permit the creation of composite pictures of an area's geographic, environmental and socio-economic characteristics. It will encourage private industry to develop new kinds of data and applications, improve emergency response measures such as 911, and ensure that Canadians in remote communities have access to the latest information.

In December 1997, Canada signed the Kyoto Protocol to the United Nations Framework Convention on Climate Change to reduce greenhouse gas emissions. Under this international agreement, Canada will reduce emissions of carbon dioxide, nitrous oxide and methane by 6% below 1990 levels by 2012. Levels of hydrofluorocarbons, perfluorocarbons and sulphur hexafluoride will be reduced by 6% below 1995 levels by 2012. In order to develop a national implementation strategy, 14 sector groupings or tables were established by the federal government to bring stakeholders together to make recommendations on how to achieve Canada's commitment by 2012. The Canadian minerals and metals sector, which is part of the Industry Table, began deliberations in 1998 to develop a national implementation strategy to find ways to effectively reduce Canada's greenhouse gas emissions.

New initiatives affecting the mineral industry were announced by provinces and territories in 1999. In Ontario, Operation Treasure Hunt was launched to encourage prospecting and development across Ontario. This is a new two-year, $19 million program that will include conducting state-of-the-art geophysical and geochemical surveys to provide mineral exploration data to the public. In Quebec, the government and the mining industry agreed to create a mineral research consortium (COREM) to conduct research and development in the processing and conversion of mineral substances. COREM will replace the Centre de recherche minérale du Québec, a similar organization. In Newfoundland, *The Mineral Act* and *The Quarry Materials Act* were amended to define dimensional stone as a mineral with land tenure administrated under *The Mineral Act*. In British Columbia, certainty of tenure was established when the B.C. government announced that it had established a clear process for determining fair compensation when mineral tenures are expropriated for parks under a new mineral compensation regulation. The Government of Manitoba announced that a mining accord had been developed that outlines a code of practice for the Manitoba mining industry. The code is endorsed by both the mining industry and the Aboriginal community.

Profiles of the Leading Minerals Produced in Canada

Gold

Canada has long been one of the world's leading producers of gold. For the fifth consecutive year, Canada trails only South Africa, the United States and Australia in the production of this precious metal. In 1999, Canada's gold output decreased from 164.8 t to 157.8 t, a decline of 4.2%. The value of gold shipments decreased by 7.8% to $2.1 billion. The average price of gold declined to US$279 per troy oz in 1999, the lowest annual price since 1978. Price volatility was higher than in 1998 with gold trading in a range of US$256-$310/oz. The main factors affecting the price were the threat of central bank sales, the announcement by European central banks to limit gold sales over the next four years and to not increase gold lending, and the decision by the International Monetary Fund to revalue part of its reserves through an off-market transaction. Although gold was trading up slightly at about US$285/oz early in 2000, gold production is likely to continue to decline in Canada throughout the year as mines close or suspend operations and companies merge or delay expansions.

In 1999, one new mine opened and two re-opened while nine mines suspended operations and five closed. About 33 primary gold mines operated in Canada at the end of 1999, accounting for over 88% of all the gold produced in Canada. Employment in these mines totaled an estimated 7417 in 1999, down from 8188 in 1998 and continuing a general downward trend that started in 1989 when employment was 12 631. In an effort to attract investors, major global producers are merging and consolidating, and this process is expected to continue and accelerate.

Copper

The volume of copper produced in Canada fell 16.0% in 1999 to 580 000 t due to the suspension of two mines in British Columbia and the closure of the Gaspé mine in Quebec. The decline in production led to a 19.7% drop in the value of copper produced in Canada to $1.4 billion. Lower copper prices also contributed to the decline in value as the average price fell to US$0.71/lb in 1999 from an average of US$0.75/lb in 1998.

Copper's properties, especially its high electrical and thermal conductivity, good tensile strength, relatively high melting point and resistance to corrosion, make it and its alloys attractive for use in electrical transmission, water tubing, castings and heat exchangers. Global consumption increased sharply in 1999 and is expected to increase again in 2000 as demand rises from the recovering economies in Southeast Asia. Copper prices are expected to recover in 2000 as the effects of closing down some operations, the deferring of some new projects, and the extension of mine and smelter shut-downs reduce supply. For the first half of 2000, copper prices have averaged about US$0.80/lb, which is close to the estimated average cost of production. However, the upside potential for the price of copper is limited by mine re-openings and producer forward hedge selling.

Zinc

Canada is the world's second largest producer of zinc, a metal used in the automotive and construction

industries for the galvanization of steel and manufacture of die-cast alloys, in the production of brass, in semi-manufactures such as rolled zinc, and in chemical applications. In 1999, the production of zinc (recoverable zinc in concentrates shipped) in Canada declined by 3.2% to 960 000 t compared to 1998, but is expected to increase by 5% in 2000. Zinc prices averaged US$0.49/lb in 1999, a 4.9% increase over 1998, reflecting strong demand and a continued decline in stock levels. World zinc consumption increased to 8.1 Mt in 1999, a total that was slightly less than world refined zinc metal production of 8.2 Mt. World consumption is expected to increase by about 2.6% in 2000, primarily due to increasing demand in Japan and Europe. Zinc stocks on the London Metal Exchange declined steadily throughout 1999 to finish the year at 279 050 t, or 38 000 t less than at the end of 1998.

For 2000, the zinc market is expected to remain fairly balanced. The market recovery in Japan and other Southeast Asian nations, as well as continued growth in North America and Europe, will probably continue to strengthen demand, pushing prices above US$0.50/lb. (Through the first half of 2000, the price has averaged about US$0.51/lb.)

Nickel

Canada is the world's second largest nickel producer, trailing Russia and ahead of New Caledonia and Australia. Nickel's resistance to corrosion, high strength, pleasing appearance and suitability as an alloying agent are characteristics that make it useful in many applications. Major markets include stainless steel, nickel- and copper-based alloys, electroplating, alloy steels, and foundry products. The stainless steel industry is the largest consumer of primary nickel, accounting for about two thirds of consumption. Consequently, the demand for nickel is largely a function of the demand for stainless steel and high-nickel alloy steels.

In 1999, nickel production in Canada decreased by 10.5% over 1998 to 177 200 t. A labour dispute at one of Canada's major nickel mines contributed to this decline. Despite this, the value of nickel produced increased by almost 11% as a result of sharply higher prices. Nickel prices averaged US$2.73/lb in 1999, but rose steadily through the year to end at US$3.66/lb. The price rise was supported by production cuts, sharply reduced nickel inventories and, in the second half of 1999, strong demand for stainless steel. After a 5.3% rise in world primary nickel consumption in 1999 to 1.06 Mt, consumption is expected to rise in 2000 to about 1.12 Mt. Nickel production in Canada could reach 204 000 t in 2000. World inventory levels are expected to continue to decline, but major production increases are on the horizon from Western Australian laterite nickel producers. For the first half of 2000, the price of nickel has averaged US$4/lb, compared to yearly averages of US$2.72/lb in 1999 and US$2.10/lb in 1998.

Iron Ore

Iron ore production levels in Canada declined by almost 10% in 1999 to 33.0 Mt, while the value of production fell 13.8% to $1.42 billion. Over 80% of the volume and value of iron ore shipments is exported. The United States was the largest single customer in 1999, receiving 29% of the shipments. The European Union was the recipient of 60% of the shipments of Canadian iron ore in 1999, up from 53% in 1998.

For 1999, prices were negotiated lower on both the European (reduction of 11-14%) and Japanese (reduction of 11%) markets. The Japanese steel market experienced a moderate recovery that, coupled with strong markets elsewhere, resulted in increased demand for iron ore.

The price for 1999 dropped by about US$2/t from the 1998/99 base of US$19/t, due mainly to weak demand from the Asian steel industry. Australia and Brazil, which together supply over half of the world's iron ore market, set the international price in direct negotiations with Japanese and European steelmakers.

Better prices, coupled with increased sales, should allow Canadian producers to return to profitability. The Iron Ore Company of Canada recently announced that it is going ahead with the recommissioning of the Sept-Îles pellet plant at a cost of more than $360 million.

Uranium

Canada is the world's largest producer and supplier of uranium, exporting about 80% of its production. The United States is the largest market for this uranium. The world's two largest uranium-producing companies have operations in Canada. Uranium production in Canada declined by 1% in 1999 to 9892 t. (Production is defined as metal content (U) reported by producers of uranium precipitates or concentrates.) Despite this decline, uranium still ranks solidly among Canada's top 10 metal commodities in terms of value of production. An increase in uranium spot market prices to US$10.85/lb U_3O_8 during the first quarter of 1999 was unsustainable and the price slowly declined to US$9.60/lb U_3O_8 by year-end. Reflecting the downward trend in spot market prices, the average price of Canadian export deliveries also decreased from $51.10/kgU (US$13.30/lb U_3O_8) in 1998 to $49.10/kgU (US$12.70/lb U_3O_8) in 1999.

The conclusion of the commercial transaction to allow natural uranium derived from the dismantling of Russian nuclear weapons to move smoothly into Western commercial markets resolved one major con-

cern in the uranium market, reducing some of the uncertainties overhanging the market. This, in turn, will enable Canada to remain a stable and competitive supplier of uranium to world markets for the foreseeable future.

Potash

The term "potash" refers to a group of potassium-bearing minerals and chemicals. The dominant potash product is potassium chloride, a naturally occurring pink, salty mineral for which Canada is the world's leading producer and exporter. The main use of potash is in the agricultural sector where it is used to enhance the efficiency of plants in the uptake of nutrients. Other uses include detergents, ceramics, chemicals and pharmaceuticals. In 1999, potash was the second most valuable non-fuel mineral produced in Canada, trailing gold. The value of potash produced in Canada totaled $1.78 billion, a 1.6% increase over 1998. At the end of 1999, more than 3400 workers were employed at the eight underground mines and two solution mining operations in Saskatchewan and the underground mine in New Brunswick.

Canada is the world's largest potash exporter with a 40% share of international trade. Canadian exports, with the exception of those to Asia, decreased marginally in 1999.

The world's potash market was relatively balanced in 1999 as world production of 25.8 Mt K_2O remained close to 1998 levels and sales rose only 2% to 24.7 Mt K_2O. The production of potash remained stable as producers maintained inventories by using temporary shut-downs. Higher demand from Asian countries offset weaker demand from other countries such as France, the United States and Brazil. Offshore potash price quotations rose by an overall 2% for the first three quarters of 1999 but remained flat in the fourth quarter, ending the year at US$121/t. Price quotations averaged US$118.50/t standard KCl f.o.b. Vancouver during 1999.

Diamonds

In its first full year of operation, BHP Diamonds Inc.'s Ekati diamond mine in the Northwest Territories produced about 2.4 Mct of diamonds with an estimated value of $582 million. The mine accounts for about 4% of global diamond production by weight and 6% by value. New processing equipment at the mine is expected to boost production by about 50% by the latter part of 2001. Two other projects, the Snap Lake mine and the Diavik mine, are scheduled to open late in 2002 or in 2003. When these three mines are in full production they will account for about 12% of the world's supply of diamonds.

Exploration for diamonds continues in several regions in Canada and preliminary data indicate that expenditures on the search for diamonds are expected to increase from $126 million in 1999 to $161 million in 2000. Exploration is focused principally in the Northwest Territories, but Alberta, Nunavut, Ontario and Quebec have also attracted significant diamond exploration activity.

OUTLOOK

The outlook for the Canadian mineral industry in 2000 is promising as mineral prices rebound from 1998 and 1999 levels. Synchronized global economic growth is improving demand for most minerals and continued growth in the United States should benefit Canadian producers. However, increasing supplies from large low-cost mines coming on stream around the world will offset increasing demand.

The Canadian economy is expected to increase by 4.5% in 2000 and by a more sustainable 3% in 2001 after climbing by 4.5% in 1999. In the natural resource sectors, oil and gas are expected to remain bouyant and minerals and metals should see modest improvement, while agriculture and forestry are not likely to benefit. Surveys by Statistics Canada indicate that capital spending is expected to increase in 2000, a continuation of the last five years of growth. Energy-related projects in most provinces will increase economic activity across Canada. Inflation is expected to continue within the Bank of Canada's 1-3% target range while the Bank of Canada interest rate is expected to rise to 6.5% in 2000 and to decline to 6.0% by the end of 2001. Unemployment, which averaged 7.6% in 1999, should continue to decline to an average of 6.6% in 2000.

On a global basis, most forecasters are looking at GDP growth of about 4.2% for the world's economy in 2000 and 4.0% in 2001 and 2002. Continued growth in the United States will lead to strong global growth with support from an improving Japanese economy, steady growth in Europe, and growth in Latin American and Asian economies.

As commodity prices and demand are strongly influenced by the health of global economies, the strong and widespread improvements noted above bode well for the Canadian mineral industry. Along with the improving performance of Canadian mining companies, recent major merger proposal announcements (for example, Newmont Mining Corporation agreed to buy Battle Mountain Gold Company, Franco-Nevada Mining Corporation Limited announced a merger with Gold Fields Limited, and Barrick Gold Corporation offered to purchase all the outstanding common shares of Pangea Goldfields Inc.) should make the highly fragmented mining industry more attractive to investors.

Mining is often portrayed as a relatively low-tech industry. This portrayal is fast becoming obsolete.

The mining industry is adapting new technologies in an effort to improve productivity and safety and is developing technologies that can be adapted to other industries. Some examples follow:

- Inco Limited and its partners have sold one of their high-tech telemining systems to Cameco Corporation and will soon announce sales to other mining companies. Inco's tele-remote operator control of underground machinery is being further developed and will ultimately automate many more tasks.

- Falconbridge Limited has placed an order (its second) for Modular Mining Systems Intellimine™ software. The software provides key information on mobile production units involved in production mucking, backfilling and waste rock handling. The system is designed to optimize resources and to control variability of production activities and reduce production costs and downtime.

- Fourteen of the world's largest mining companies, including four from Canada, have created a joint Internet marketplace where they will have access to hundreds of suppliers. The site will allow companies to buy supplies and raw materials online, a strategy designed to decrease the US$200 billion the industry spends on those purchases each year.

- The Northern Centre for Advanced Technology Inc. (NORCAT), a non-profit company based in Sudbury, Ontario, is looking at ways to employ technologies used by Canadian mining firms in the exploration of space. Conversely, mining firms and educational institutions study ways to apply space technology to Canada's mining and other resource industries. For Canada's mining industries, the lure is the need for robotics and computers to improve safety and lower costs. Space agencies are looking at the possibility of mining hydroxide rocks in space to extract oxygen and hydrogen instead of shipping these elements into space.

In general, applying technical advances in automation, robotics and telecommunications will result in better worker safety, more accurate drilling and blasting, faster ore extraction, higher output, productivity gains and lower costs. Early investments in automation have already achieved significant productivity gains, improved drill-bit lifetimes and lowered maintenance costs. These changes will likely result in fewer underground mine employees, but will also create well-paid, skilled surface jobs and will make mining safer. If increased automation allows Canada's mining companies to compete more successfully, it will create wealth for mining communities and benefit the whole economy. Technological innovation in the Canadian mining industry is a very positive development for the industry's future.

Notes: (1) Information in this review was current as of June 2000. (2) This and other reviews, including previous editions, are available on the Internet at http://www.nrcan.gc.ca/mms/cmy/index_e.html.

NOTE TO READERS

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TABLE 1. CANADA, PRODUCTION OF LEADING MINERALS, 1998 AND 1999p

		Volume		Percent Change	Value		Percent Change
		1998	1999p	1999/1998	1998	1999p	1999/1998
		(000 tonnes except where noted)			($ millions)		
METALS							
Gold	kg	164 773	157 790	–4.2	2 312.6	2 132.5	–7.8
Nickel		198	177	–10.5	1 411.2	1 563.0	10.8
Zinc		992	960	–3.2	1 507.2	1 533.3	1.7
Iron ore		36 586	33 004	–9.8	1 646.4	1 419.7	–13.8
Copper		691	580	–16.0	1 695.8	1 361.3	–19.7
Uranium	tU	9 992	9 892	–1.0	508.0	502.5	–1.1
Silver	t	1 140	1 173	2.9	301.1	296.5	–1.5
Platinum group	kg	15 588	14 012	–10.1	236.0	250.9	6.3
Lead		150	156	4.1	117.6	117.4	–0.2
Cobalt	t	2 262	2 015	–10.9	158.6	114.0	–28.1
Molybdenum	t	8 099	6 293	–22.3	98.8	75.7	–23.3
NONMETALS							
Potash (K_2O)		8 884	8 345	–6.1	1 748.0	1 775.8	1.6
Diamonds	000 carats	203	2 400	1 082.3	40.8	581.7	1 326.7
Salt		13 034	12 643	–3.0	390.7	391.5	0.2
Peat		1 125	1 216	8.1	166.5	168.8	1.3
Asbestos		321	345	7.5	167.4	162.5	–2.9
Gypsum		8 307	8 935	7.6	94.3	101.2	7.3
Sulphur, elemental		8 404	8 792	4.6	62.1	80.7	30.0
Sulphur in smelter gas		836	846	1.2	55.5	63.1	13.8
Nepheline syenite		636	693	9.0	53.4	58.0	8.6
STRUCTURAL MATERIALS							
Cement		12 124	12 604	4.0	1 147.8	1 232.1	7.3
Sand and gravel		225 338	218 458	–3.1	875.2	861.7	–1.6
Stone		108 924	104 026	–4.5	727.9	732.4	0.6
Lime		2 461	2 538	3.1	215.0	235.6	9.6
Clay products		..	..	..	135.8	165.7	22.0
MINERAL FUELS							
Petroleum, crude	000 m^3	128 401	122 448	–4.6	12 940.1	18 894.0	46.0
Natural gas	million m^3	160 515	163 384	1.8	10 893.5	13 696.4	25.7
Natural gas by-products	000 m^3	26 666	26 075	–2.2	1 763.1	2 347.3	33.1
Coal		75 360	72 310	–4.0	1 764.8	1 484.4	–15.9

Sources: Natural Resources Canada; Statistics Canada, *Canada's Mineral Production, Preliminary Estimates*, cat. no. 26-202-XIB.
.. Not available; p Preliminary.
Note: Numbers have been rounded. Percent changes are based on unrounded data.

TABLE 2. CANADA, VALUE OF DOMESTIC EXPORTS, TOTAL EXPORTS (INCLUDING RE-EXPORTS), IMPORTS, AND BALANCE OF TRADE OF MINERALS AND MINERAL PRODUCTS, STAGES I TO IV, 1995-99

	1995	1996	1997	1998	1999
			($000)		
TOTAL MINING, INCLUDING FUELS					
Domestic exports	61 648 825	67 867 539	71 497 523	68 352 704	71 283 564
Total exports	63 105 723	69 082 166	72 967 312	69 489 214	72 447 956
Imports	39 903 358	42 333 336	50 205 741	53 731 462	55 280 764
Balance of trade	23 202 365	26 748 830	22 761 571	15 757 752	17 167 192
NON-FUEL MINING					
Domestic exports	38 272 045	39 368 644	41 714 562	42 780 403	41 969 529
Total exports	38 938 207	40 078 789	42 544 306	43 767 037	42 992 400
Imports	30 899 727	31 494 439	37 356 917	42 932 502	43 743 418
Balance of trade	8 038 480	8 584 350	5 187 389	834 535	-751 018
TOTAL NON-FUEL MINING, INCLUDING COAL					
Domestic exports	40 639 065	41 989 018	44 449 132	45 302 944	44 002 176
Total exports	41 309 253	42 700 794	45 279 932	46 290 575	45 028 534
Imports	31 589 695	32 251 995	38 236 081	44 074 028	44 860 445
Balance of trade	9 719 558	10 448 799	7 043 851	2 216 547	168 089
TOTAL ECONOMY					
Domestic exports	248 440 788	259 265 000	281 255 740	297 451 300	330 409 547
Total exports	264 207 000	275 773 600	299 089 922	318 383 900	354 107 556
Imports	225 629 195	232 648 033	272 855 758	298 381 900	319 909 560
Balance of trade	38 577 805	43 125 567	26 234 164	20 002 000	34 197 996

Sources: Natural Resources Canada; Statistics Canada.

Canadian Reserves of Selected Major Metals, and Recent Production Decisions

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Reserves of Selected Major Metals

Canadian reserves of copper molybdenum, lead, zinc, silver and gold decreased significantly during 1998. Only nickel reserves were higher than in 1997 (Table 1).

Generally declining metal prices during 1998 caused many mining companies to make their ore reserve calculations at year-end based upon lower metal prices than they had used at the end of 1997. This resulted in reductions in ore reserves at most producing mines and a number of mine closures.

In Canada during 1998, there were only two announcements of new production decisions for the seven metals reviewed in this chapter. Given that metal prices continued to fall during 1999, it is probable that Canadian ore reserve levels for the major metals will continue to decline in the immediate future. The Voisey's Bay nickel-copper-cobalt deposit in Labrador is not presently included in Canadian reserves because there are several major issues to be resolved before production can begin. When a production decision is made, it will result in major increases in the reserves of nickel and copper.

Reserves Policy

Canadian reserves are estimated from information contained in annual and other corporate reports, and from the responses of mining companies to the annual Federal-Provincial Survey of Mines and Concentrators.

Reserves reported here include only metal contained in material that is classified by companies as "proven" or "probable" (or their equivalents) at producing mines and in deposits that are firmly committed to production (Table 2). Metal contained in mineral resources classified by companies as "possible" (or its equivalents) is not included in national totals, nor is metal contained in deposits that have not advanced beyond the deposit appraisal phase (Figure 1). When available, only metal contained in mineable ore is included in Canadian totals to exclude losses inherent in the mining process. Every effort is made to achieve, from year to year, consistency in the reserves reported here; however, consistency ultimately depends on industry practice, which has evolved over the years. Imperial units reported by companies have been converted to metric units and the results have been rounded to the appropriate number of significant digits.

Reserves by Commodity

Gold

There were 1415 t of gold contained in Canadian mine reserves in December 1998. This represents a decrease of 6% (95 t) compared to revised totals for December 1997. The major components of this decrease were the cancellation of production plans at the Aquarius mine (-40 t) of Echo Bay Mines Ltd. in Ontario and the depletion of reserves without replacement at many of the major gold mining operations. Notable increases in gold reserves were reported at the Red Lake mine (+55 t) of Goldcorp Inc. and the Dome mine (+8 t) of Placer Dome North America in Ontario, the Sigma mine (+11 t) of McWatters Mining Inc. and the Doyon mine (+11 t) of Barrick Gold Corporation in Quebec, and the Eskay Creek mine (+5 t) of Prime Resources Group in British Columbia.

Silver

There were 15 738 t of silver contained in Canadian mine reserves in December 1998. This represents a decrease of 6% (980 t) compared to revised totals for

Figure 1
Generalized Model of the Mineral Development and Mining Process

PHASES	MINERAL RESOURCE ASSESSMENT	MINERAL EXPLORATION					MINERAL DEPOSIT APPRAISAL				MINE COMPLEX DEVELOPMENT	MINERAL PRODUCTION	ENVIRONMENTAL RESTORATION
	MRA	EX-1	EX-2	EX-3	EX-4	EX-5	DA-1	DA-2	DA-3	DA-4	MCD	MP	ER
STAGES	Surveys, research, synthesis.	Exploration planning.	Regional reconnaissance and surveys.	Prospecting and ground survey of anomalies.	Verification of anomalies and showings.	Discovery and delimitation.	Deposit definition.	Project engineering.	Project economics.	Feasibility study. Production decision.	Mine development. Infrastructure, plant, equipment.	Production, marketing, new development.	Mine closure. Site reclamation and restoration.
OBJECTIVES	Supply information and tools required to develop the mineral potential of the nation for economic benefit, in the perspective of sustained development.	Select target commodities. Establish exploration objectives and strategies. Select target areas.	Find regional and more localized anomalies. Select significant targets.	Acquire properties. Confirm presence, exact location and characteristics of anomalies.	Acquire additional properties as required. Investigate anomalies. Find mineral showings.	Discover, delimit a mineral deposit of potential economic interest. Appraise current technical and economic data to justify a deposit appraisal program.	Define the limits, internal grade distribution and controls, mineralogy and mineral processing character of the deposit. Acquire data for engineering planning.	Establish technical feasibility. Obtain realistic plans, schedules, investment costs and operating cost estimates for all aspects of the project.	Obtain all the parameters required and carry out economic, financial and social-political evaluation of the project.	Ensure the validity of project data, assumptions and evaluation results to achieve mine complex development and production objectives. Decide whether or not to undertake the project. Obtain the required permits.	Complete mine development and construction on schedule and within budget. Ensure efficient and timely mine and concentrator start-up according to schedule, forecasts and specifications.	Achieve planned rate and specifications of commercial production on schedule and within budget. Achieve mine profitability, company survival and sustained development.	Restore mine site to an environmentally acceptable condition.
EVALUATION METHODS	Geoscientific, mineral and economic surveys, research, compilations and synthesis by governments, research institutes and universities.	Metal and mineral market research. Review of geological and ore deposit information for various areas. Review of legal and political contexts.	Remote sensing aerial photography and airborne geophysics. Prospecting, geology and geochemistry. Appraisal, rating and selection of anomalies.	Ground-based geological, geochemical and geophysical prospecting and surveys. Review and selection of significant anomalies.	Geological mapping and other surveys. Trenching and sampling. Review of results and selection of targets.	Stripping, trenching, detailed mapping, sampling, drilling and down-hole geophysics. Preliminary deposit inventory and evaluation. Environmental characterization and site surveys.	Detailed mapping, sampling and drilling on surface or from underground. Systematic mineral processing tests. Detailed environmental and site surveys.	Pilot tests and engineering studies. Design, cost estimation for mining, mineral, metal processing, infrastructure, environmental protection and restoration.	Market, price, cost and other financial studies. Technical, environmental, economic, financial, social and political risk analysis.	Exhaustive due diligence review of the geological, engineering, environmental, economic, legal and site data. Evaluation of the profitability, risks and up-side factors.	Project and quality management methods. Training program for personnel and detailed start-up plan.	Production management using continuous quality improvement methods. Exploration, appraisal and development of new ore zones, both on the mine site and off-property.	Mine closure and decommissioning. Environmental restoration and monitoring.
RESULTS	Geoscientific, mineral and economic databases, maps and models.	Exploration projects.	Regional anomalies.	Local anomalies.	Mineral showings.	Mineral deposit.	Deposit appraisal project.			Mining project.	Mining Complex.	Mineral production.	Restored site.
FEASIBILITY STUDIES	Expected margin of error of estimates at the 90% confidence level					Expected margin of error of estimates at the 90% confidence level:							
						± 100%	± 60%	± 40%	± 20%	± 10%		± 5%	Full compliance
INVESTMENT RISK LEVEL	Low /moderate Moderate	Low but increasing investments. Very high, but decreasing risk of failure and financial loss.					Much larger and increasing investments. High, but decreasing risk of failure.				Large to very large industrial investment. Low to moderate industrial type risk.		
MINERAL INVENTORY	Undelimited mineral resources					Inferred	Delimited mineral resources				Ore reserves		
	Speculative	Hypothetical				Inferred	Indicated and measured				Proven and probable		

Sources: Modified by D.A. Cranstone, A. Lemieux and M. Vallée, February 25, 1994, from M. Vallée, 1992, *Guide to the Evaluation of Gold Deposits*, CIM Special Volume 45, p. 4, and *SOQUEM Annual Report*, 1976-77, pp. 4-5. Revised July 23, 1999.

December 1997. The major components of this decrease were the downward revision of reserves at the Brunswick No. 12 mine (-389 t) and the closure of the Caribou mine (-560 t) in New Brunswick. The only silver-producing mines to significantly increase their reserves during 1998 were the LaRonde mine (+931 t) in Quebec and the Kidd Creek No. 3 mine (+446 t) in Ontario.

Zinc

During 1998, Canadian reserves of zinc decreased to about 10.2 Mt, down by about 4% (-429 000 t) compared to the previous year. The major components of this decrease were the downward revision of reserves at the Brunswick No. 12 mine (-468 000 t), and the closure of the Caribou mine (-426 000 t) in New Brunswick. The only zinc mines to significantly increase their ore reserves in 1998 were LaRonde (+637 000 t) in Quebec and the Kidd Creek No. 3 mine (+646 000 t) in Ontario.

Lead

Canadian reserves of lead decreased by approximately 21% during 1998 to 1 845 000 t. This was largely as a result of the closure of the Caribou mine (-230 000 t) and the downward reassessment of reserves at the Brunswick No. 12 mine (-184 000 t) in New Brunswick.

Copper

In December 1998, Canadian reserves of copper were estimated at about 8.4 Mt, or down by about 7% (-630 000 t) from a year earlier. Copper reserves were reduced as a result of the closure of the Gibraltar mine (-385 000 t) and the downward revision of reserves at the Highland Valley mine (-300 000 t) in British Columbia. Copper reserves were increased at the Inco Limited Ontario Division mines (+359 000 t), the Kidd Creek No. 3 mine (+154 0000 t) in Ontario, and the new Konuto Lake mine (+45 000 t) of Hudson Bay Mining and Smelting Co. Limited (HBMS) in Saskatchewan.

Molybdenum

Canadian reserves of molybdenum stood at 121 000 t in December 1998, or about 19% lower than in the previous year. This decrease was largely due to the closure of the Gibraltar mine in British Columbia.

Nickel

In December 1998, there were some 5.7 Mt of nickel contained in Canadian mine reserves, up by approximately 11% from 1997 levels. This increase is due largely to successful exploration by Inco Limited in the vicinity of its operating mines in Ontario.

Inco had some 4.8 Mt of nickel in Canadian reserves at the end of 1998, or about 84% of the national total. It is expected that development of the copper-nickel-cobalt deposits at Voisey's Bay in Labrador will make major additions to Canada's mineable reserves of these metals in the near future.

Canadian Reserves by Province and Territory

Four provinces (Ontario, British Columbia, New Brunswick and Quebec) held dominant positions in terms of Canada's proven and probable mineable reserves of major metals in December 1998 (Table 4).

Ontario had 72% of the nickel, 51% of the gold and 50% of the copper, plus 22% of the silver and 18% of the zinc.

British Columbia had 100% of the molybdenum, 35% of the copper and 32% of the silver, plus 14% of the lead, 9% of the zinc and 19% of the gold.

New Brunswick had 76% of the lead, 35% of the zinc and 25% of the silver, plus 2% of the copper and 2% of the gold.

Quebec had 26% of the zinc, 20% of the gold, 9% of the copper, 10% of the nickel and 18% of the silver.

Manitoba had 18% of the nickel, 6% of the zinc and 4% of the gold, plus 4% of the copper and 2% of the silver.

The Yukon Territory had less than 1% of the gold and the silver.

The Northwest Territories had 6% of the zinc, 6% of the lead and 3% of the gold.

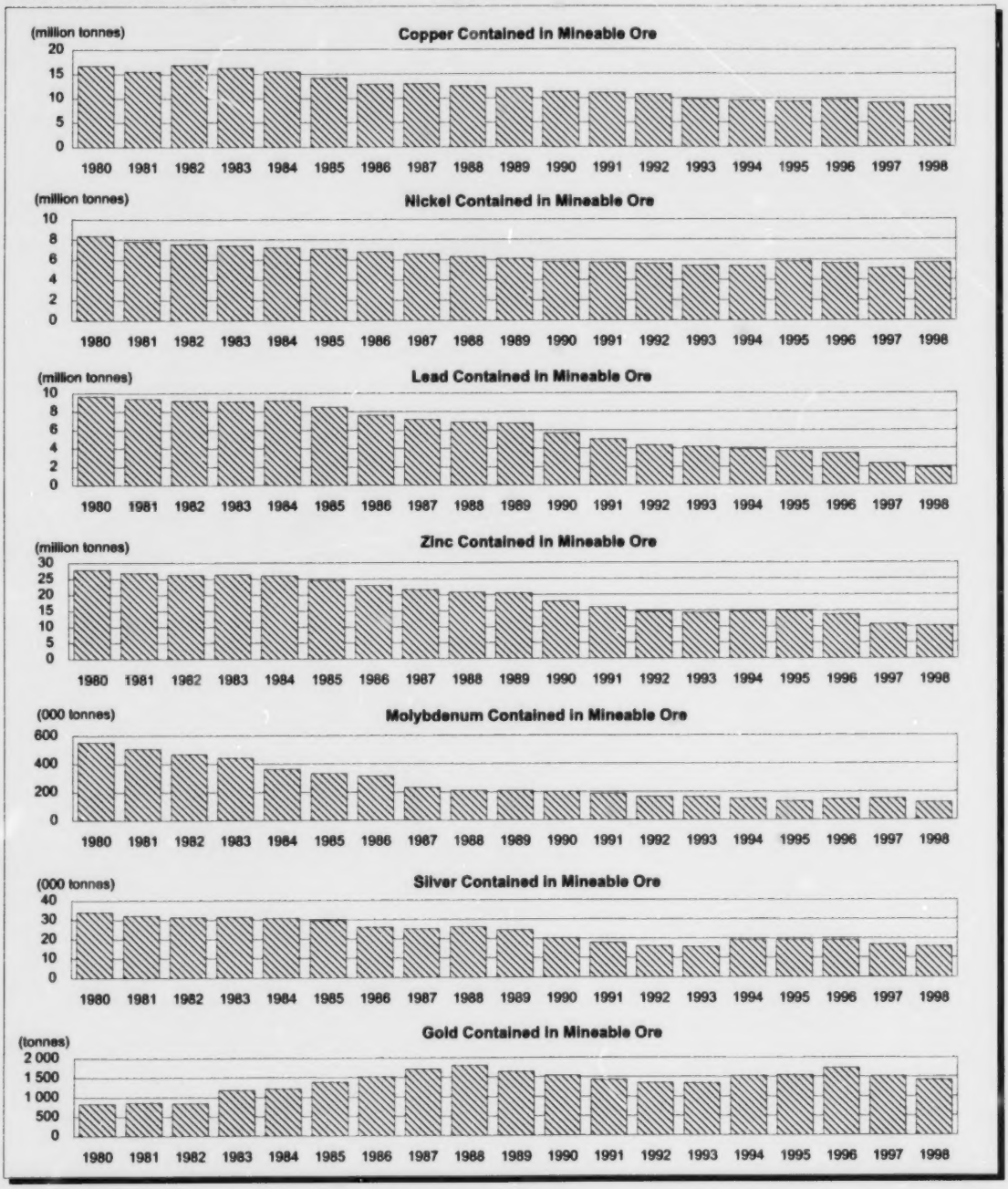
Canadian Reserves by Industry

Canadian mines are, to a large extent, polymetallic, a complexity that the Standard Industrial Classification (SIC) tends to oversimplify (Table 5).

Current mine reserves of gold in Canada are distributed through the various SIC classes as follows: gold mines, 78%; copper and copper-zinc mines, 15%; nickel-copper mines, 5%; and zinc-lead-silver mines, 2%. Current mine reserves of silver in Canada are distributed through the various SIC classes as follows: gold mines, 34%; copper and copper-zinc mines, 29%; nickel-copper mines, 9%; and zinc-lead-silver mines, 28%.

Current mine reserves of copper in Canada are distributed through the various SIC classes as follows: gold mines, 1%; copper and copper-zinc mines, 52%; nickel-copper mines, 44%; and zinc-lead-silver mines,

Figure 2
Canadian Reserves of Selected Major Metals, 1980-98
Metal Contained in Proven and Probable Mineable Ore in Operating Mines and Deposits Committed to Production, as at December 31 of Each Year



Source: Natural Resources Canada, based on company reports and the Federal-Provincial Survey of Mines and Concentrators.
Note: This series was revised during 1996.

2%. Current mine reserves of molybdenum in Canada are contained in the SIC classes as follows: copper and copper-zinc mines, 36%; and molybdenum mines, 64%.

Current mine reserves of nickel in Canada are contained entirely in the SIC class of nickel-copper mines.

Current mine reserves of lead in Canada are contained in the SIC classes as follows: copper and copper-zinc mines, 6%; and zinc-lead-silver mines, 94%. Current mine reserves of zinc in Canada are contained in the SIC classes as follows: gold mines, 10%; copper and copper-zinc mines, 42%; and zinc-lead-silver mines, 48%.

Apparent Life of Canadian Reserves

The apparent life (life index) of mine reserves is usually calculated by dividing the total amount of metals remaining in mine reserves at the end of a given year by the corresponding amount of metals contained in the ores produced during that year. Similar calculations are often applied at the national level.

At the national level, life indices are but a very rough measure of the expected life of aggregate mine reserves, and they are often misleading unless abnormal situations are recognized. Life indices based on proven and probable reserves do not make allowances for inferred extensions to reserves at current mines, gross additions that will accrue to current reserves from the likely development, in the foreseeable future, of known orebodies for which a production decision has yet to be made, or expected changes in production rates. Furthermore, life indices tend to overstate the apparent life of reserves when, for example, annual production is abnormally low due to strikes, cutbacks or suspensions at large establishments, or when significant increases in capacity resulting from new production decisions will be coming on stream, but only several years hence.

The apparent life indices for the major metals in Canada at the end of 1998 were 22 years for nickel, 11 years for copper, 6 years for molybdenum, 10 years for silver, 7 years for lead, 8 years for zinc, and 7 years for gold.

Reserve Trends

Figure 2 and Table 6 show how Canadian reserves of copper, nickel, lead, zinc, molybdenum and silver have declined steadily since the early 1980s. In contrast, gold reserves increased substantially until 1988, before starting a gradual decline. At the end of 1998, Canadian reserves of copper, lead, zinc and molybdenum were lower than at any time since Natural Resources Canada began keeping records, and reserves of nickel, silver and gold were only slightly higher than the recent historic lows that occurred in 1993 and 1994.

The annual aggregate change in Canadian reserves is the net result of three main factors affecting individual mines (Figure 3): additions to reserves, deletions to reserves, and production. Additions to reserves are the result of new discoveries; of new geological, metallurgical, production or other information; of a decrease in production costs; or of a rise in commodity prices, all of which increase the quantity of mineral resources that are profitable to mine. Deletions to reserves are the result of new geological, metallurgical, production or other information; of increases in costs; or of decreases in commodity prices, all of which reduce the quantity of mineral resources previously counted in mine reserves that are now expected to be mined at a profit. Production is normally the main factor reducing the reserves at individual mines but, in 1998, declining metal prices were a significant factor in the reduction of ore reserves at producing mines.

Recent Production Decisions

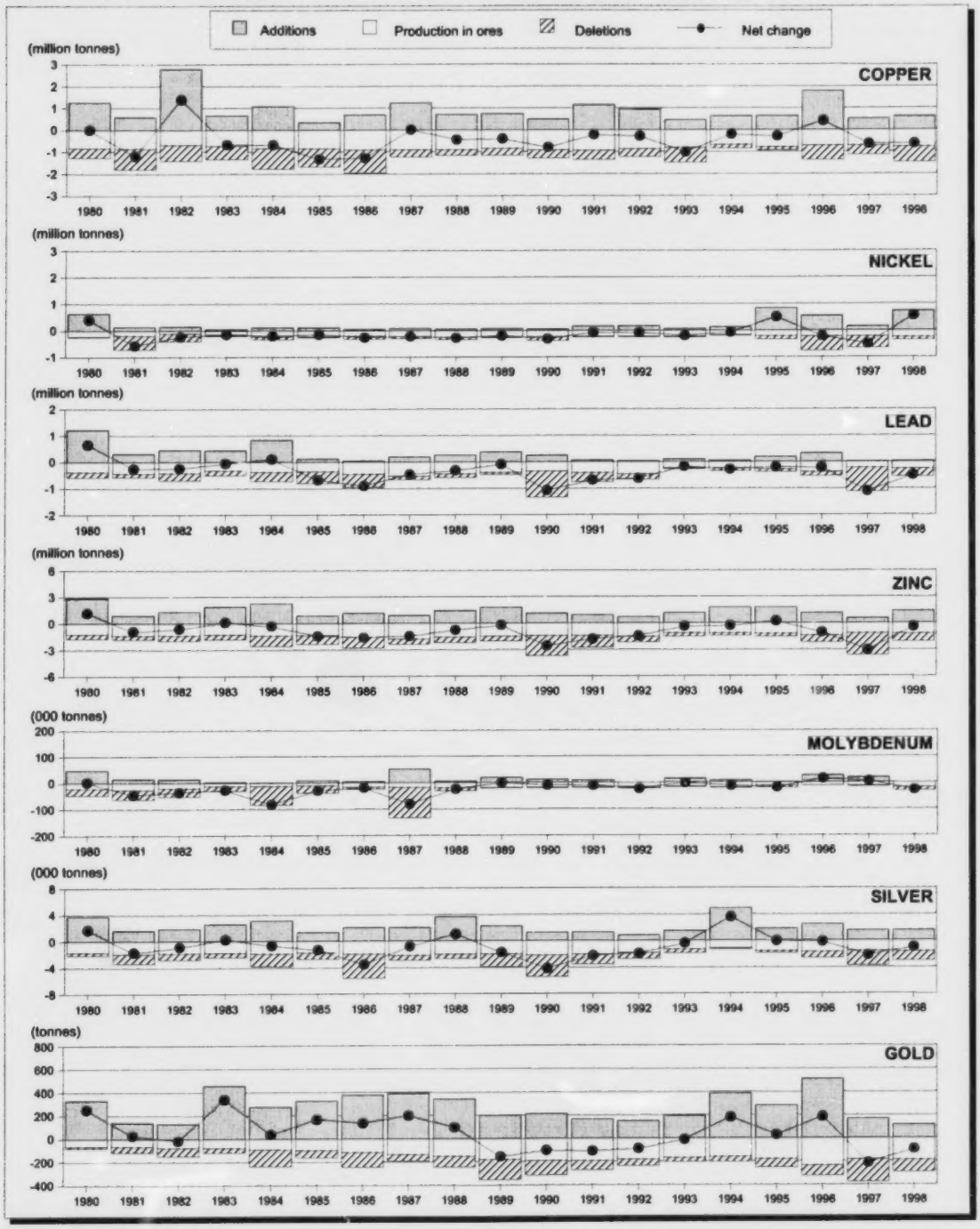
Several criteria need to be met for a project to be considered here to have reached the production decision stage. In general, there needs to have been a positive production feasibility study, all of the necessary permits must have been obtained, financing must have been arranged, and directors must have approved construction.

During 1998, production decisions were announced for the Konuto Lake mine at Creighton, Saskatchewan, and for the Black Dome mine near Clinton, British Columbia (Table 3).

During 1999, HBMS announced plans to bring the 777 deposit at Flin Flon, Manitoba, and the Chisel North deposit at Snow Lake, Manitoba, into production. The 777 deposit has reserves of 13.4 Mt containing 3.32% copper, 5.78% zinc, 2.7 g/t gold and 38 g/t silver. The Chisel North deposit has reserves of 2.4 Mt containing 10.8% zinc. Also during 1999, St. Andrew Goldfields Ltd. announced plans to begin production from a small open-pit mine on the Hislop West zone near Matheson, Ontario.

Inco Limited's Voisey's Bay deposit in Labrador is poised for a production decision, but it is not included as a 1999 production decision because not all of the necessary permits and agreements were in place at that time.

Figure 3
Main Components of Change in Canadian Reserves of Selected Major Metals, 1980-98



Source: Natural Resources Canada.

OUTLOOK

Given that metal prices continued to decline in 1999, it is highly probable that mine reserves of precious metals and base metals will fall further in 1999.

At the Voisey's Bay nickel-copper-cobalt deposit, Inco had established proven reserves of 32 Mt grading 2.83% nickel, 1.68% copper and 0.12% cobalt at the end of 1998. If these figures are confirmed, Voisey's Bay will increase Canada's nickel reserves by about 16% and its copper reserves by about 6%.

Note: Information in this review was current as of February 11, 2000.

NOTE TO READERS

The intent of this document is to provide general information and to elicit discussion. It is not intended as a reference, guide or suggestion to be used in trading, investment, or other commercial activities. The author and Natural Resources Canada make no warranty of any kind with respect to the content and accept no liability, either incidental, consequential, financial or otherwise, arising from the use of this document.

TABLE 1. MAIN COMPONENTS OF CHANGE DURING 1998 IN CANADIAN RESERVES OF SELECTED MAJOR METALS

Metal	Units	Revised Opening Metal Balance, January 1998	Metal in Ore Mined During 1998	Metal Apparently Written Off During 1998	Metal in New Reserves Found During 1998	Net Change During 1998	Closing Metal Balance, December 1998	% Change During 1998
Copper	000 t	9 032	–777	–694	841	–630	8 402	–7
Nickel	000 t	5 122	–257	–90	909	562	5 683	11
Lead	000 t	2 344	–265	–290	56	–499	1 845	–21
Zinc	000 t	10 588	–1 221	–869	1 660	–429	10 159	–4
Molybdenum	000 t	149	–19	–12	3	–28	121	–19
Silver	t	16 697	–1 646	–405	2 073	–981	15 738	–6
Gold	t	1 510	–190	–103	198	–95	1 415	–6

Source: Natural Resources Canada, based on company reports and the Federal-Provincial Survey of Mines and Concentrators.
Note: May not balance due to rounding.

TABLE 2. TONNAGES AND GRADES OF OPERATIONS INCLUDED IN CANADIAN RESERVES OF SELECTED MAJOR METALS, AS AT JANUARY 1, 1999

Tonnages classified by companies as "possible" are not included where they are reported separately from proven and probable tonnages, nor are tonnages for deposits for which there is no firm production decision. Data reported in imperial units were converted to metric units and rounded to the corresponding number of significant digits. Confidential data have been suppressed from the details of this report.

	Tonnes	Grade						
		Cu	Ni	Pb	Zn	Mo	Ag	Au
		(%)	(%)	(%)	(%)	(%)	(g/t)	(g/t)
NEWFOUNDLAND								
Nugget Pond								
Richmont Mines Inc.								
Proven and probable	318 000							12
NEW BRUNSWICK								
Brunswick No. 12 Underground								
Noranda Inc.								
Proven	33 961 000	0.39		3.42	8.66		94	..
Probable	6 807 000	0.27		3.39	8.10		87	..
Heath Steele								
Noranda Inc.								
Proven	584 000	0.60		2.26	7.46		84	
Probable	184 000	0.20		3.09	10.41		118	
QUEBEC								
Beaufor								
Aurizon Mines Ltd.								
Louvem Mines Inc.								
Proven	295 000						..	7.7
Probable	602 000						..	8.2
Bell Allard								
Noranda Inc.								
Proven	983 000	1.06			11.79		34.5	0.81
Probable	2 552 000	1.57			14.46		44.2	0.75
Bouchard-Hébert (Mobrun 1100 Lens)								
Cambior inc.								
Proven and probable	6 308 000	0.75			4.37		38.5	1.3
Bousquet No. 2								
Barrick Gold Corporation								
Proven and probable	2 937 000	..					..	7.1
Doyon								
Barrick Gold Corporation								
Cambior inc.								
Reserves	11 100 000						..	7.4
East Amphi								
McWatters Mining Inc.								
Proven and probable	131 000							5.96
Francoeur								
Richmont Mines Inc.								
Proven and probable	787 000						..	6.5
Gallen								
Noranda Metallurgy Inc.								
Probable	1 106 000	0.16			4.74		31.1	1.12
Joe Mann								
Campbell Resources Inc.								
Proven and probable	468 640	0.243					..	7.85
Joubi (Dubuisson)								
Western Quebec Mines Inc.								
Proven	33 190						..	4.85
Kiena								
McWatters Mining Inc.								
Proven and probable	3 385 000						..	4.43
Langlois (Grevet)								
Cambior inc.								
Proven and probable	6 117 000	0.51			8.99		40.7	0.1
LaRonde (Dumagami)								
Agnico-Eagle Mines Limited								
Probable	15 000 000	0.19			6.42		93.6	2

TABLE 2 (cont'd)

	Tonnes	Grade						
		Cu	Ni	Pb	Zn	Mo	Ag	Au
		(%)	(%)	(%)	(%)	(%)	(g/t)	(g/t)
QUEBEC (cont'd)								
Louvicourt								
Aur Resources Inc.								
Novicourt Inc.								
Teck Corporation								
Proven	5 484 000	3.86			1.62		28.93	0.93
Probable	3 038 000	3.00			1.77		27.37	0.84
Murdochville Townsite								
Noranda Inc.								
Proven	529 000	3.9					19	..
Needle Mountain Open Pit								
Noranda Inc.								
Stocks	157 600	..					..	
Raglan								
Falconbridge Limited								
Proven	7 855 000	0.77	2.85					
Probable	11 494 000	0.77	2.85					
Selbaie (Detour) A1 Open Pit								
Billiton Metals Canada Inc. (Gencor Ltd.)								
..	..	..		..	..		..	..
Sigma								
McWatters Mining Inc.								
Proven and probable	7 048 000						..	4.23
Sleeping Giant								
Aurizon Mines Ltd.								
Cambior inc.								
Proven	243 000						..	12.9
Probable	487 000						..	11.5
Troilus (Lac Frotet)								
INMET Mining Corporation								
Proven and probable	49 200 000	0.10					1.1	1
ONTARIO								
Campbell								
Placer Dome North America								
Proven and probable	4 451 000						..	14.8
David Bell								
Homestake Canada Inc.								
Teck Corporation								
Probable	4 200 000						..	10.3
Detour Lake								
Placer Dome North America								
Proven and probable	711 000						..	3.5
Dome (including Paymaster)								
Placer Dome North America								
Proven and probable	33 357 000						..	1.9
Eagle River								
River Gold Mines Ltd.								
Proven	515 000						..	8.88
Probable	711 000						..	11.48
Edwards								
River Gold Mines Ltd.								
VenCan Gold Corporation								
Proven	70 800						..	18.48
Probable	75 800						..	20.94
Falconbridge Sudbury Integrated Nickel Operations								
Falconbridge Limited								
Proven	12 338 000	1.33	1.55					
Probable	11 250 000	1.33	1.55					
Glimmer								
Exall Resources Limited								
Glimmer Resources Inc.								
Mineable	966 915							9.03

TABLE 2 (cont'd)

	Tonnes	Grade						
		Cu	Ni	Pb	Zn	Mo	Ag	Au
		(%)	(%)	(%)	(%)	(%)	(g/t)	(g/t)
ONTARIO (cont'd)								
Golden Giant								
Battle Mountain Gold Company								
Proven and probable	6 937 000						..	9.53
Holloway								
Battle Mountain Gold Company								
Teddy Bear Valley Mines, Limited								
Proven and probable	4 395 000						..	6.75
Holt-McDermott								
Barrick Gold Corporation								
Proven and probable	2 742 000						..	6.93
Hoyle Pond								
Kinross Gold Corporation								
Proven and probable	1 413 000						..	10.72
Inco Ontario Division[1]								
Inco Limited								
..	..	..	..				..	..
Kidd Creek No. 1[2]								
Falconbridge Limited								
Proven	6 913 000	..		..	..		..	
Kidd Creek No. 2[2]								
Falconbridge Limited								
Proven	1 934 000	..		..	..		..	
Kidd Creek No. 3[2]								
Falconbridge Limited								
..	..	..		..	..		..	
Lac-des-Îles (palladium-platinum)								
North American Palladium Ltd.								
..	..	..	..					..
Macassa								
Kinross Gold Corporation								
Proven and probable	877 000						..	12.38
Madsen Gold								
Claude Resources Inc.								
Proven and probable	315 217							9.34
Musselwhite								
Placer Dome North America								
TVX Gold Inc.								
Proven and probable	10 822 000							5.7
Red Lake (Arthur W. White)								
Goldcorp Inc.								
HGZ probable	1 317 736						..	47
Sulphide proven and probable	1 259 979						..	12
Royal Oak Ontario Division								
Royal Oak Mines Inc.								
Reserves	26 012 000						..	1.5
Williams								
Homestake Canada Inc.								
Teck Corporation								
Proven and probable	27 200 000						..	5.1
MANITOBA								
Bissett (San Antonio)								
Harmony Gold Mining Company Limited								
Proven	600 000						..	8.28
Probable	1 270 000						..	8.5
Callinan								
Hudson Bay Mining and Smelting Co., Limited								
..	..	..			..		..	..
Inco Manitoba Division[1]								
Inco Limited								
..	..	..	..				..	..
Keystone								
Black Hawk Mining Inc.								
Reserves	493 700						..	3.7

TABLE 2 (cont'd)

	Tonnes	Grade						
		Cu	Ni	Pb	Zn	Mo	Ag	Au
		(%)	(%)	(%)	(%)	(%)	(g/t)	(g/t)
MANITOBA (cont'd)								
New Britannia (Nor-Acme/Snow Lake)								
High River Gold Mines Ltd.								
TVX Gold Inc.								
Reserves	3 602 000						..	5
Ruttan								
Hudson Bay Mining and Smelting Co., Limited								
Proven and probable	10 500 000	1.0			0.16		..	..
Trout Lake								
Hudson Bay Mining and Smelting Co., Limited								
Proven	2 743 199	1.60			4.69		18.3	1.6
Probable	3 031 672	1.77			4.03		15.6	1.3
SASKATCHEWAN								
Konuto Lake								
Hudson Bay Mining and Smelting Co., Limited								
..	1 600 000	4.0			1.2		..	..
Seabee								
Claude Resources Inc.								
Proven and probable	559 808						..	8.97
BRITISH COLUMBIA								
Blackdome								
Claimstaker Resources Ltd.								
Jipangu Inc.								
Proven and probable	128 627						37	14
Endako								
Nissho Iwai Corporation								
Thompson Creek Mining Limited								
..	..					..		
Eskay Creek								
Prime Resources Group Inc.								
Reserves	1 500 000						2 490	58
Golden Bear								
North American Metals Corp.								
Stockpile	200 000							2.9
Ursa	519 400							6.9
Kodiak B	183 900							8.7
Highland Valley								
Cominco Ltd.								
Highmont Mining Company								
Rio Algom Limited								
Teck Corporation								
Proven and probable	417 000 000	0.42				..	..	..
Huckleberry								
Mitsubishi Corporation, Dowa Mining Co., Ltd., Furukawa Co. Ltd., Marubeni Corporation, and Imperial Metals Mining Corporation								
Proven and probable	74 745 100	0.509				0.014	2.82	0.062
Kemess South								
Royal Oak Mines Inc.								
Proven and probable	196 436 000	0.218						0.62
Mount Polley								
Imperial Metals Corporation								
Sumitomo Corp.								
Proven and probable	74 000 000	0.296						0.391
Myra Falls								
Westmin Resources Limited								
Proven and probable	6 785 000	1.5		0.4	7.7		35	1.4
Snip								
Prime Resources Group Inc.								
Reserves	100 000						..	22.7

TABLE 2 (cont'd)

	Tonnes	Grade						
		Cu	Ni	Pb	Zn	Mo	Ag	Au
		(%)	(%)	(%)	(%)	(%)	(g/t)	(g/t)
BRITISH COLUMBIA (cont'd)								
Sullivan								
Cominco Ltd.								
Proven and probable	6 100 000			3.7	6.6		20	
YUKON TERRITORY								
Brewery Creek (heap leach)								
Viceroy Resource Corporation								
Reserves	11 800 000						..	1.1
Mount Nansen								
B.Y.G. Natural Resources Inc.								
Proven	15 499						..	..
NORTHWEST TERRITORIES								
Con								
Miramar Mining Corporation								
Proven and probable	1 247 000						..	11.66
Giant Open Pit - Giant Underground								
Royal Oak Mines Inc.								
Proven	14 411						..	12.5
Probable	437 095						..	12.4
Lupin								
Echo Bay Mines Ltd.								
Proven and probable	1 831 000						..	9.22
Nanisivik								
Nanisivik Mines Ltd.								
Proven and probable	3 460 000			..	8.2		36	
Polaris								
Cominco Ltd.								
Pine Point Mines Limited								
Reserves	2 900 000			3.3	12.8			

Source: Natural Resources Canada, based on published company reports.
.. Not available in published reports or estimated by author.
[1] Inco Limited reports total Canadian ore reserves as 337 000 000 t grading 1.06% copper and 1.58% nickel. [2] Falconbridge Limited reports proven and probable ore reserves as 31 746 000 t grading 2.30% copper, 5.67% zinc, and 62 g/t silver.
Notes: One tonne (t) = 1.1023113 short tons. One gram per tonne (g/t) = 0.02916668 troy ounces per short ton.

TABLE 3. PRODUCTION DECISIONS ADDED TO CANADIAN RESERVE TOTALS AS AT DECEMBER 31, 1998

Project	Operators and Major Partners	Province	Metals
Blackdome	Claimstaker Resources Ltd. and Jipangu Inc.	British Columbia	Gold, silver
Konuto Lake	Hudson Bay Mining and Smelting Co., Limited	Saskatchewan	Copper, zinc

Source: Natural Resources Canada, based on company reports.

TABLE 4. CANADIAN RESERVES OF SELECTED MAJOR METALS BY PROVINCE AND TERRITORY, AS AT DECEMBER 31, 1998

Metal Contained in Proven and Probable Mineable Ore[1] in Operating Mines[2] and Deposits Committed to Production

Metal	Units[3]	Nfld.	N.S.	N.B.	Que.	Ont.	Man.	Sask.	B.C.	Yukon	N.W.T.	Canada[5]
Copper	000 t	–	–	152	744	4 218	314	45	2 929	–	–	8 402
Nickel	000 t	–	–	–	552	4 093	1 038	–	–	–	–	5 683
Lead	000 t	–	–	1 411	9	64	–	–	256	–	106	1 845
Zinc	000 t	–	–	3 555	2 649	1 800	561	14	925	–	655	10 159
Molybdenum	000 t	–	–	–	–	–	–	–	121	–	–	121
Silver	t	–	–	3 877	2 775	3 491	354	11	5 095	5	131	15 738
Gold[4]	t	4	–	25	277	726	59	7	266	13	37	1 415

Source: Natural Resources Canada, based on company reports and the Federal-Provincial Survey of Mines and Concentrators.
– Nil or less than one unit.
[1] No allowance is made for losses in milling, smelting and refining. Excludes material classified as "possible." Includes "geological reserves" for some mines that do not report mineable ore. [2] Includes metal in mines where production has been suspended temporarily. [3] One tonne (t) = 1.1023113 short tons = 32 150.746 troy ounces. [4] Excludes metal in placer deposits because reserves data are generally unavailable. [5] May not balance due to rounding at the provincial level.

TABLE 5. CANADIAN RESERVES OF SELECTED MAJOR METALS BY INDUSTRY, AS AT DECEMBER 31, 1998

Metal Contained in Proven and Probable Mineable Ore[1] in Operating Mines[2] and Deposits Committed to Production

	SIC no.[5]	Gold Mines 0611	Copper, Copper-Zinc Mines 0612	Nickel-Copper Mines 0613	Zinc-Lead-Silver Mines 0614	Molybdenum Mines 0615	Miscellaneous Metal Mines 0619	Canada[6]
	(Units[3])							
Copper	000 t	92	4 400	3 708	199	–	2	8 402
Nickel	000 t	–	–	5 681	–	–	2	5 683
Lead	000 t	–	103	–	1 742	–	–	1 845
Zinc	000 t	990	4 280	–	4 889	–	–	10 159
Molybdenum	000 t	–	43	–	–	78	–	121
Silver	t	5 338	4 611	1 425	4 364	–	–	15 738
Gold[4]	t	1 099	212	70	33	–	1	1 415

Source: Natural Resources Canada, based on company reports and the Federal-Provincial Survey of Mines and Concentrators.
– Nil or less than one unit.
[1] No allowance is made for losses in milling, smelting and refining. Excludes material classified as "possible." Includes "geological reserves" for some mines that do not report mineable ore. [2] Includes metal in mines where production has been suspended temporarily. [3] One tonne (t) = 1.1023113 short tons = 32 150.746 troy ounces. [4] Excludes metal in placer deposits because reserves data are generally unavailable. [5] SIC Standard Industrial Classification. [6] May not balance due to rounding at the SIC level.

TABLE 6. CANADIAN RESERVES OF SELECTED MAJOR METALS AS AT DECEMBER 31 OF EACH YEAR, 1977-98

Metal Contained in Proven and Probable Mineable Ore[1] in Operating Mines[2] and Deposits Committed to Production

Year	Copper	Nickel	Lead	Zinc	Molybdenum	Silver	Gold[3]
	(000 t)	(000 t)	(000 t)	(000 t)	(000 t)	(t)	(t)
1977	16 914	7 749	8 954	26 953	369	30 991	493
1978	16 184	7 843	8 930	26 721	464	30 995	505
1979	16 721	7 947	8 992	26 581	549	32 124	575
1980	16 714	8 348	9 637	27 742	551	33 804	826
1981	15 511	7 781	9 380	26 833	505	32 092	851
1982	16 889	7 546	9 139	26 216	469	31 204	833
1983	16 214	7 393	9 081	26 313	442	31 425	1 172
1984	15 530	7 191	9 180	26 000	361	30 757	1 208
1985	14 201	7 041	8 503	24 553	331	29 442	1 373
1986	12 918	6 780	7 599	22 936	312	25 914	1 507
1987	12 927	6 562	7 129	21 471	231	25 103	1 705
1988	12 485	6 286	6 811	20 710	208	26 122	1 801
1989	12 082	6 092	6 717	20 479	207	24 393	1 645
1990	11 261	5 776	5 643	17 847	198	20 102	1 542
1991	11 040	5 691	4 957	16 038	186	17 859	1 433
1992	10 755	5 605	4 328	14 584	163	15 974	1 345
1993	9 740	5 409	4 149	14 206	161	15 576	1 333
1994	9 533	5 334	3 861	14 514	148	19 146	1 513
1995	9 250	5 832	3 660	14 712	129	19 073	1 540
1996	9 667	5 623	3 450	13 660	144	18 911	1 724
1997	9 032	5 122	2 344	10 588	149	16 697	1 510
1998	8 402	5 683	1 845	10 159	121	15 738	1 415

Source: Natural Resources Canada, based on company reports and the Federal-Provincial Survey of Mines and Concentrators.

[1] No allowance is made for losses in milling, smelting and refining. Excludes material classified as "possible." Includes "geological reserves" for some mines that do not report mineable ore. [2] Includes metal in mines where production has been suspended temporarily. [3] Excludes metal in placer deposits because reserves data are generally unavailable.

Note: One tonne (t) = 1.1023113 short tons = 32 150.746 troy ounces.

Mineral Exploration, Deposit Appraisal and Mine Complex Development Activity in Canada

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INTRODUCTION

This review describes in detail, and provides analytical highlights of, mineral development activities from primary exploration to mine production in Canada in 1998. Emphasis is placed on mineral exploration and deposit appraisal expenditures. Also briefly presented are preliminary estimates for total 1999 expenditures and company spending intentions for 2000, as well as other exploration indicators such as drilling and claim-staking activity.

Total mineral development investment in Canada on the three work phases – mineral exploration, deposit appraisal, and mine complex development (including expenditures for capital, and repair and maintenance) – fell by 19.5% from $5.7 billion in 1997 to $4.6 billion in 1998 (Table 1a). Total mineral development expenditures (excluding expenditures for capital and repair and maintenance) amounted to $1.6 billion in 1998, a decrease of 9.2% from $1.8 billion in 1997 (Table 2a). Expenditures on the combined exploration and deposit appraisal work phases totaled $656 million in 1998, a decrease of some 29%, or $265 million, from 1997. Approximately 87.8% of this spending, or $575.9 million, was for field work and overhead costs. Of the other types of work activities included as exploration and deposit appraisal, engineering studies at $36.9 million and environmental expenditures at $31.7 million were the next highest expenditure categories. Exploration and deposit appraisal activities in 1998 continued to be targeted at diamonds in the Northwest Territories and Alberta, and at nickel-copper in Newfoundland (Labrador).

The 1998 decline reflects factors such as the continuation of low metal commodity prices during the year, lower investor confidence in reaction to the Bre-X stock incident in 1997, and the Asian financial and economic crisis. Other important factors include land access concerns and a shift of company commitments to exploration and development activities in other countries.

Expenditures are compiled from the federal-provincial-territorial Survey of Mineral Exploration, Deposit Appraisal and Mine Complex Development Expenditures, which is described in the Background section later in this article. This annual federal-provincial-territorial survey of exploration and mining companies provides an accurate measure of mineral development activity in Canada. In 1998, survey results were compiled from the reports of 604 active company project operators and some prospectors (Table 4).

The data presented in this review for 1998 and beyond, as well as the data for 1997, are based on new survey definitions that were introduced in 1997. Detailed 1997 statistics used for comparison can be found in the 1998 edition of the *Canadian Minerals Yearbook*.

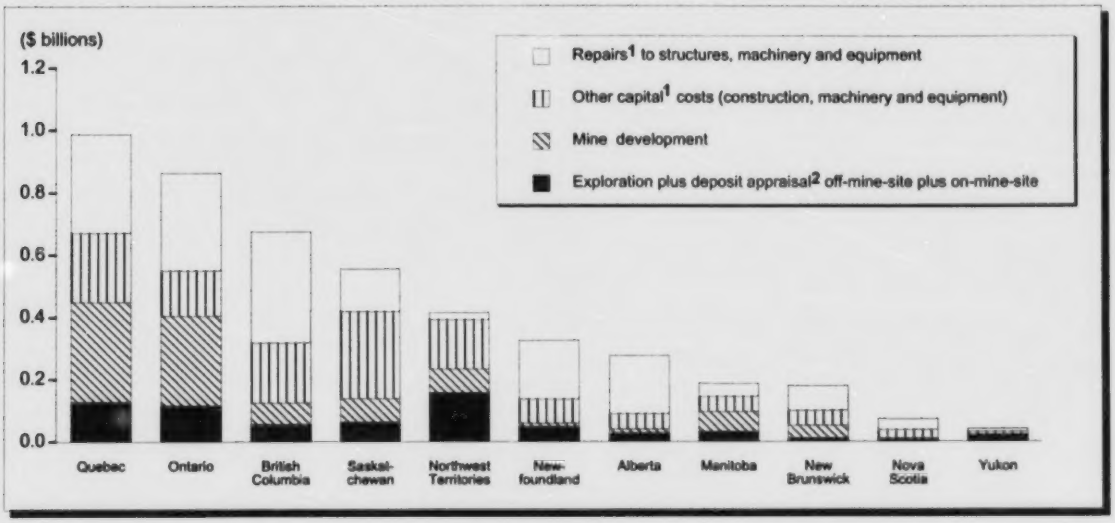
MINERAL DEVELOPMENT EXPENDITURES, 1998

Activities covered in the three work phases of mineral development can be aggregated into two broad categories: field work and overhead, and new expenditures. Overhead expenditures include mineral leases, claims, rental costs, and project-related head office expenditures. New expenditures include engineering, economic and pre- or production feasibility studies, environment and land access expenditures.

Mineral Exploration

Of the $1.6 billion in mineral development expenditures in 1998, the mineral exploration phase (which includes activities up to and including the first delineation of a previously unknown mineral deposit to establish its potential economic value [tonnage and grade]) accounted for $462.8 million in 1998 compared to $634.4 million in 1997 (Table 1a). In both

Figure 1
Total Mineral Development Expenditures in Canada, by Province and Territory, 1998
$4.6 Billion



Source: Natural Resources Canada, from a federal-provincial-territorial survey of mining and exploration companies.
[1]Includes expenditures related to exploration, deposit appraisal and mine complex development.[2] Exploration and deposit appraisal activities include only the search for and appraisal of deposits and do not include work for extensions of known reserves.

years, field work and overhead costs comprised over 95% of these expenditures. In 1998, some 85.3% of spending in the mineral exploration phase was at off-mine-site locations, down from 90.2% in 1997.

Deposit Appraisal

For the deposit appraisal phase (which includes activities that bring a delineated deposit to the stage of detailed knowledge required for a production feasibility study), expenditures in 1998 totaled $193.1 million, down from the $286.6 million spent in 1997 (Table 1a). Approximately two thirds, or $130.9 million, was spent on field work and overhead in 1998 compared to 77.1%, or $220.8 million, in 1997. The percentage of deposit appraisal expenditures spent on off-mine-site locations was 68.1% in 1998 and 63.1% in 1997 (Table 1a).

Mine Complex Development

Expenditures on the mine complex development phase (which includes activities to outline, block out and gain access to the ore, prepare it for production, and increase ore reserves) increased to $966.1 million in 1998, up from $865.5 million in 1997, an increase of 11.6% (Table 1a). Approximately 96.1% of such expenditures was expended on field work and overhead in 1998 as in 1997. All activities in the mine complex expenditure phase are on-mine-site activities.

Total Mineral Development Investment, 1998

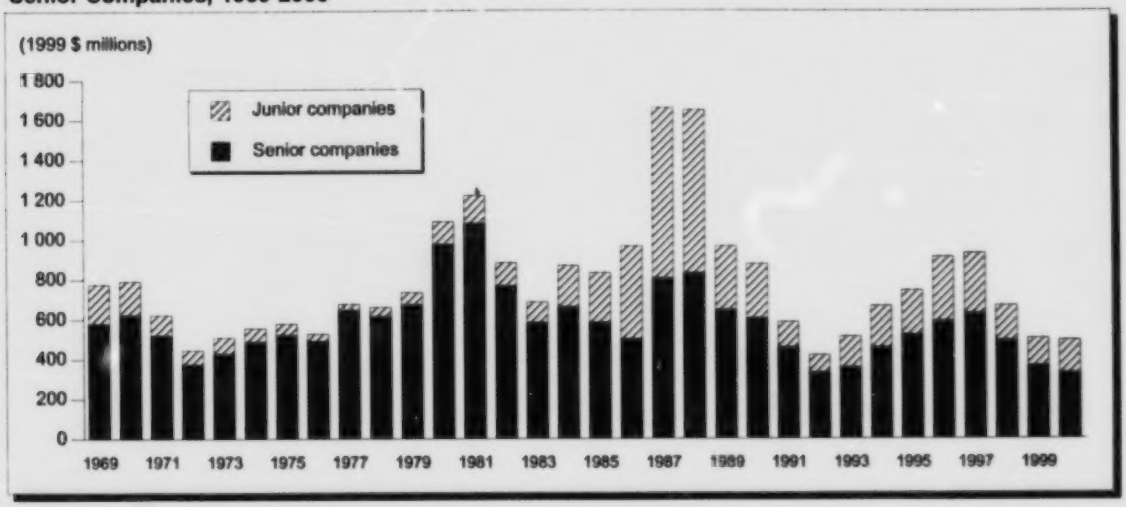
Total mineral development investment in Canada (mineral development expenditures including expenditures for capital and repair and maintenance) fell by 19.5% from $5.7 billion in 1997 to $4.6 billion in 1998 (Table 1a). Capital, and repair and maintenance expenditures, which include expenditures for construction, machinery and equipment, are generally mainly related to mine complex development. In 1998, over 97.2% of total capital expenditures of $1.3 million were spent on mine complex development. For repair and maintenance, total expenditures for all phases amounted to $1.7 billion with some 98.7% of that amount spent in the mine complex development work phase (Table 2a). Total investment for mine complex development only accounted for 84% of all mineral development investment.

Historical Perspective

Figure 2 shows the historical trend in exploration plus deposit appraisal expenditures adjusted in constant 1999 dollars (using the categories of expenditures collected before 1997, i.e., field and overhead) (see also Table 3). After peak levels of exploration and deposit appraisal expenditures were reached in 1987 and 1988 (principally as a result of the Cana-

Figure 2

Exploration Plus Deposit Appraisal for Field Work Plus Overhead Expenditures,[1] by Junior and Senior Companies, 1969-2000



Source: Natural Resources Canada, from a federal-provincial-territorial survey of mining and exploration companies.
1 Includes on-mine-site plus off-mine-site activities.
Notes: Total exploration expenditures for 1975-81 are overstated by an average of about 17% relative to earlier and later years because of changes to the methodology used by Statistics Canada over the years. Expenditures for 1997 to 2000 include both exploration plus deposit appraisal as per new definitions; up to and including 1996, most of the expenditures now included in the deposit appraisal work phase were reported under exploration (broadly speaking). Data for 1999 are preliminary estimates; data for 2000 are company spending intentions.

dian Mining Exploration Depletion Allowance [MEDA]), the activity fell to a low of $419 million in 1992 (in constant 1999 dollars). From 1993 to 1996, higher metal prices and significant diamond and nickel-copper discoveries in the Northwest Territories (Lac de Gras) and Labrador (Voisey's Bay), respectively, caused the level of activity to rebound to reach $912 million in 1996 and $829 million in 1997. While recent survey data indicate lower expenditures of $586 million in 1998 and $426 million in 1999, these amounts represent a level of activity higher than the low level of expenditures reported in 1992.

Preliminary Estimates, 1999, and Spending Intentions, 2000

Preliminary estimates for 1999 show a further decline in mineral development expenditures to $1.3 billion from $1.6 billion in 1998 and, for 2000, company spending intentions are estimated at $1.2 billion (Table 2c).

Of these totals, mineral exploration and deposit appraisal expenditures are estimated at $501 million for 1999 with company spending intentions for 2000 estimated at $502 million, approximately the same level. These estimates are down from 1998 expenditures of $656 million.

For total mineral development investment, the 1999 estimate is $3.4 billion, down from $4.6 billion in 1998. Company spending intentions for 2000 are $3.3 billion.

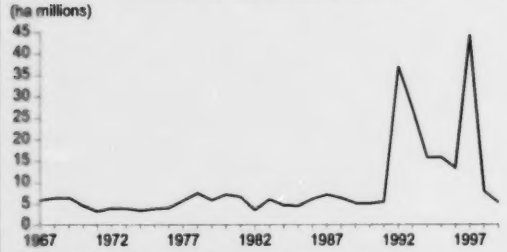
These reduced levels of activity are in response to the continued weaknesses in metal prices, notably gold prices, and the general lack of investor enthusiasm for the minerals industry.

More About Mineral Development Activities

While traditional indicators of exploration activity include new mineral claims acquired and the total number of metres drilled (Figure 3), over the years expenditures on mineral exploration have proven to provide the most accurate indicators of mineral exploration activity. The wide spectrum of activities and geographic dispersion across Canada require detailed and sophisticated indicators to measure activity levels. The additional information now collected by mineral development work phase is allowing a better and more complete monitoring of activities for an exploration project as it progresses toward the mine development stage.

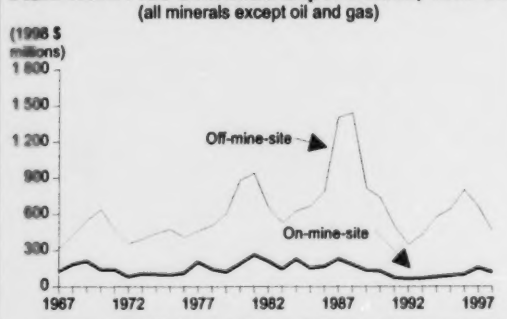
Figure 3
Selected Measures of Exploration Activity

Area of New Mineral Claims Staked or Recorded, 1967-99



Source: Information obtained and compiled annually by Natural Resources Canada from provincial and territorial mining recorders.

Exploration Plus Deposit Appraisal, Field Work Plus Overhead Expenditures, 1967-98
(all minerals except oil and gas)



Sources: 1967-84, Statistics Canada, *Exploration, Development and Capital Expenditures for Petroleum and Natural Gas Wells, Intentions* (cat. no. 61-216); 1985-97, from a federal-provincial-territorial survey of mining and exploration companies.
Notes: Adjusted to 1998 dollars using Gross Domestic Product deflator series. These expenditures do not include expenditures for oil and gas exploration. Expenditures for 1997 and 1998 include exploration plus deposit appraisal as per new definitions; up to and including 1996, most of the expenditures now included in the deposit appraisal work phase were under exploration (broadly speaking). Off-mine-site and on-mine-site overhead expenditures for 1967-88 were estimated based on an average from the years 1989-96.

Surface Diamond Drilling, 1967-98
(all minerals except oil and gas)

Sources: 1967-84, Statistics Canada (cat. no. 26-201); 1985-96, from a federal-provincial-territorial survey of mining and exploration companies.
Note: Drilling statistics for 1967-84 are not strictly comparable to and may be understated relative to those for 1985-96.

New Mineral Claims, 1999

New mineral claims staked or recorded in Canada in 1999 covered an area of 5.2 million hectares (ha), compared to 7.9 million ha in 1998. Alberta, Nunavut, Quebec and Ontario accounted for 60% of the total staking activity during the year (Tables 6a and 6b). For the third year in a row, Alberta was the leading province with over 1 million ha staked, accounting for nearly 20% of total new mineral claim activity. However, this was down significantly from the diamond claim staking that has occurred in Alberta in recent years, most notably in 1997 when over 37 million ha were staked. Among other provinces in 1999, significant declines were experienced in Saskatchewan (-84.3%), its third consecutive year with a major decline, and in Newfoundland (-33.4%).

Drilling Activity for Exploration and Deposit Appraisal, 1998

Total exploration and deposit appraisal drilling (both diamond and other types) amounted to 2.6 million metres (m) in 1998 (Tables 9c and 10), down from 3.8 million m in 1997. Of the 1998 total, diamond drilling accounted for 94.6%, or 2.46 million m. Surface exploration and deposit appraisal drilling totaled 1.87 million m, 92.5% being diamond drilling. Underground exploration and deposit appraisal drilling amounted to 0.73 million m, all of this being diamond drilling. The statistics reveal that 60% of all underground metres drilled were for on-mine-site exploration, a fact that is easy to understand considering the access that is available around a mine committed to production or in production.

In terms of regional activity in 1998, Ontario, Quebec, the Northwest Territories, Manitoba and British Columbia, in decreasing order of importance, were the busiest jurisdictions accounting for 81.9% of total drilling (surface and underground) (Table 9c).

Of the 1 866 000 m drilled for surface exploration and deposit appraisal, 45% was undertaken for precious metals, 33.1% for base metals, 5.9% for uranium, 5.8% for diamonds, and 5.1% for coal. Ontario at 25.3%, Quebec at 22.9% and the Northwest Territories at 15.1% were the leading jurisdictions for surface drilling in Canada during 1998 (Table 11a).

Of the 732 000 m drilled for underground exploration and deposit appraisal, precious metals activity accounted for 61.3% and base metals for 33.1%. Ontario accounted for 54.4% of total underground activity followed by Quebec at 32.7% (Table 11b).

On-Mine-Site and Off-Mine-Site Exploration and Deposit Appraisal Expenditures, 1998

Exploration and deposit appraisal expenditures for off-mine-site activity were $526.5 million in 1998 with on-mine-site activity at $129.4 million (Table 1a). Field work and overhead expenditures accounted for 87.2% of the off-mine-site activity and 90.3% of on-mine-site activity. These levels are down from 1997 when expenditures were $753 million for off-mine-site work and $168 million for on-mine-site work. Field work and overhead expenses accounted for 88.6% and 91.1% of the expenditures, respectively.

Off-mine-site exploration activity only represents 60% ($395 million) of the total exploration and deposit appraisal expenditures.

Of the off-mine-site exploration and deposit appraisal spending of $526.5 million that occurred in Canada in 1998, the Northwest Territories ranked first with 27.5% of total expenditures followed by Quebec at 14.7% and Ontario at 14.6% (Table 7). In comparison, for on-mine-site spending of $129.4 million, Quebec accounted for 38.5% of the total while Ontario accounted for 29.4% and the Northwest Territories accounted for 8.2%.

Of the mineral commodities sought in 1998, precious metals accounted for 32.0% of off-mine-site expenditures followed by base metals for 29.5% and diamonds for 20.8%. On-mine-site expenditures in the search for precious metals amounted to 57.5% of the total, with base metals at 28.3% and diamonds at 7.7% (Table 12).

Exploration and Deposit Appraisal Activity by Province/Territory, 1998

Across the country, with the exception of an increase in Saskatchewan, activity levels in 1998 were down in all jurisdictions from 1997. Only the Northwest Territories, Ontario and Quebec had expenditures in excess of $100 million. Indeed, these three jurisdictions accounted for 60.6% of Canada's total exploration and deposit appraisal expenditures during 1998. Notwithstanding this activity, significant declines in activity still occurred in both Quebec and Ontario, as well as in British Columbia and the Yukon. The Northwest Territories ranked first in each of the exploration and deposit appraisal work phases (Tables 9a, 9b and 9c).

Mine Complex Development Expenditures, 1998

Mine complex development expenditures rose to $966.1 million in 1998, an increase of 11.6% from $865.5 million in 1997 (Table 9d). Seven jurisdictions (New Brunswick, Quebec, Ontario, Saskatchewan, Alberta, British Columbia and the Northwest Territories) showed increases over 1997. Quebec at $321.8 million and Ontario at $287.5 million accounted for 63.1% of total 1998 expenditures.

Precious metals accounted for 29.6% of total mine complex development expenditures in 1998 followed by base metals at 29.1% and iron at 10.6% (Table 13e).

Mineral Development Activity by Type of Work, 1998

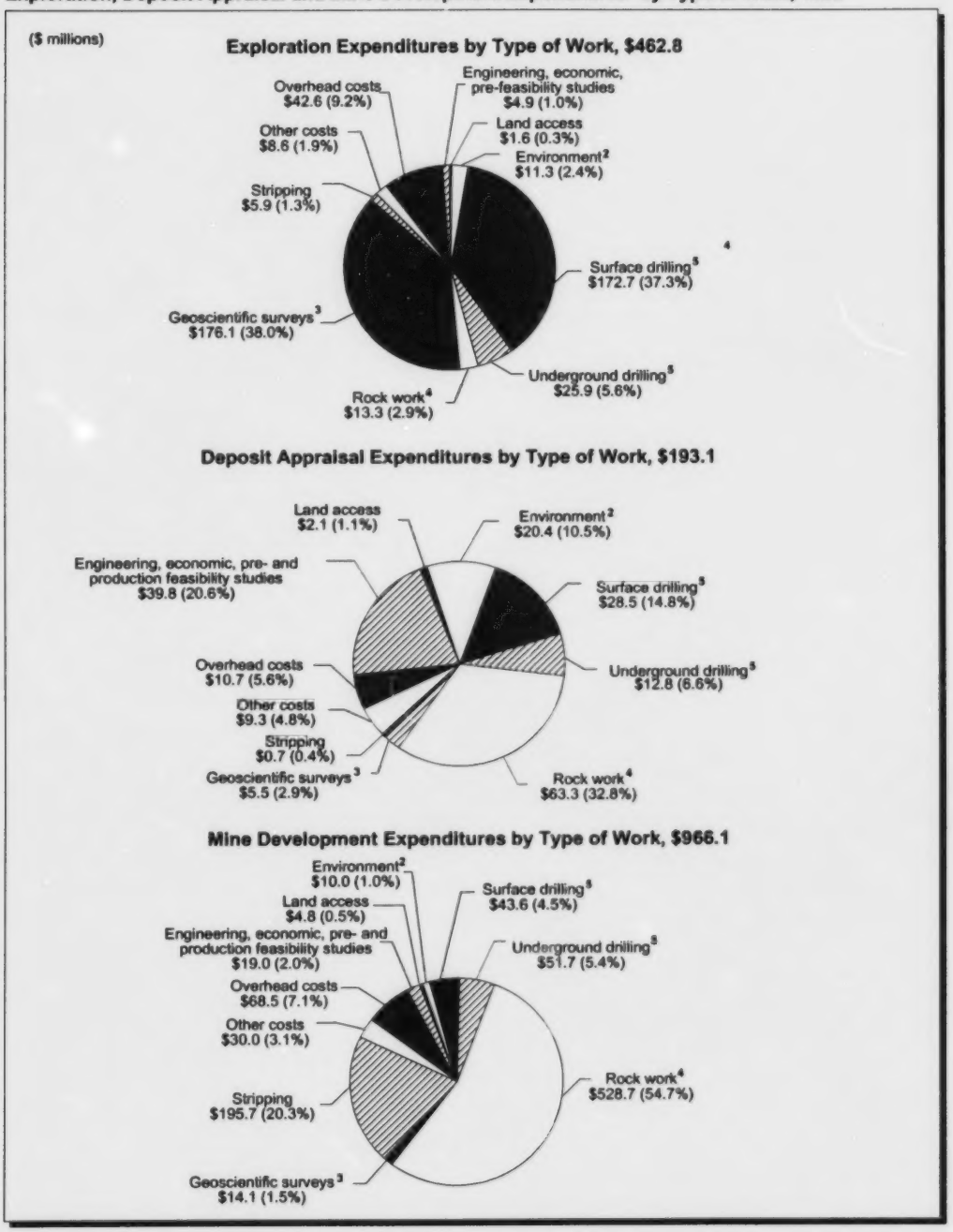
Canadian exploration and deposit appraisal expenditures in 1998 can be broken down by type of activity as follows: drilling, 36.6%; geology, 13.4%; rock work including trenches, pits and underground workings, 12.7%; other field costs, mineral leases and head office, 10.9%; airborne and ground geophysics, 8.6%; engineering, economic and pre- and production feasibility studies, 6.7%; geochemistry, 5.7%; environment, 4.8%; and land access, 0.6% (Table 9c).

Figure 4 shows graphically and quantitatively how the distribution of expenditures in the exploration work phase is different from that in the deposit appraisal work phase. In 1998, exploration expenses involved: drilling, 42.9%; geoscientific surveys, 38.0%; rock work (including stripping), 4.2%; overhead and other costs, 11.1%; engineering, economic and feasibility studies, 1.0%; environment, 2.4%; and land access, 0.3% (Table 9a). On the other hand, the breakdown for deposit appraisal expenditures were: drilling, 21.4%; geoscientific surveys, 2.9%; rock work (including stripping), 33.2%; overhead and other costs, 11.4%; engineering, economic and feasibility studies, 20.6%; environment, 10.5%; and land access, 1.1% (Table 9b).

The distribution of expenditures in the mine complex development phase is even more distinctive with expenditures of: drilling, 9.9%; geoscientific surveys, 1.5%; rock work (including stripping), 54.7%; overhead and other costs, 10.2%; engineering, economic and feasibility studies, 2%; environment, 1%; and land access, 0.5% (Table 9d).

The distribution pattern reflects project evolution over time. One notices first that exploration is mainly characterized by the drilling and geoscientific surveys that are used intensely to discover a deposit and complete its first delineation. In the deposit appraisal work phase, the deposit is defined by further drilling and the beginning of important underground work. Ultimately, a feasibility study is conducted. This phase, if successful, concludes with a commitment to go into production. The mine complex development phase starts with large-scale underground rock work and capital investment in order to build the mine and its facilities.

Figure 4
Exploration, Deposit Appraisal and Mine Development Expenditures[1] by Type of Work, 1998


($ millions)
Exploration Expenditures by Type of Work, $462.8
Overhead costs $42.6 (9.2%)
Engineering, economic, pre-feasibility studies $4.9 (1.0%)
Land access $1.6 (0.3%)
Other costs $8.6 (1.9%)
Environment[2] $11.3 (2.4%)
Stripping $5.9 (1.3%)
Surface drilling[5] $172.7 (37.3%)
Geoscientific surveys[3] $176.1 (38.0%)
Underground drilling[5] $25.9 (5.6%)
Rock work[4] $13.3 (2.9%)
Deposit Appraisal Expenditures by Type of Work, $193.1
Land access $2.1 (1.1%)
Environment[2] $20.4 (10.5%)
Engineering, economic, pre- and production feasibility studies $39.8 (20.6%)
Surface drilling[5] $28.5 (14.8%)
Underground drilling[5] $12.8 (6.6%)
Overhead costs $10.7 (5.6%)
Other costs $9.3 (4.8%)
Stripping $0.7 (0.4%)
Geoscientific surveys[3] $5.5 (2.9%)
Rock work[4] $63.3 (32.8%)
Mine Development Expenditures by Type of Work, $966.1
Environment[2] $10.0 (1.0%)
Surface drilling[5] $43.6 (4.5%)
Land access $4.8 (0.5%)
Engineering, economic, pre- and production feasibility studies $19.0 (2.0%)
Underground drilling[5] $51.7 (5.4%)
Overhead costs $68.5 (7.1%)
Other costs $30.0 (3.1%)
Rock work[4] $528.7 (54.7%)
Stripping $195.7 (20.3%)
Geoscientific surveys[3] $14.1 (1.5%)

Source: Natural Resources Canada, from a federal-provincial-territorial survey of mining and exploration companies.

[1] Includes on-mine-site plus off-mine-site activities. [2] Environment includes characterization, permitting, protection, monitoring and restoration.

[3] Geoscientific surveys include geology, geochemistry, ground geophysics and airborne geophysics. [4] Rock work activity includes shaft work, drifts, cross-cuts, raises, declines, rock sampling and dewatering costs. [5] Drilling includes diamond and other types of drilling.

Airborne geophysics accounted for $20.6 million of the expenditures on geoscientific surveys in the exploration and deposit appraisal work phases in 1998 (97% of geoscientific survey expenditures occur during the exploration phase). The Northwest Territories and Alberta accounted for 69.1% of these expenditures as the search for diamondiferous kimberlites continued during the year. Expenditures on geochemical surveys amounted to $37.5 million with 53% of the total activity taking place in the Northwest Territories and diamonds being the principal target for most of these expenditures (Table 9c).

Exploration and Deposit Appraisal Expenditures by Mineral Commodity Sought, 1998

Precious metals (including gold, silver and platinum group metals), base metals (including copper, nickel, lead and zinc), and diamonds continued to be the principal targets of exploration and deposit appraisal activities in Canada in 1998 (Tables 12 and 13c, and Figure 5).

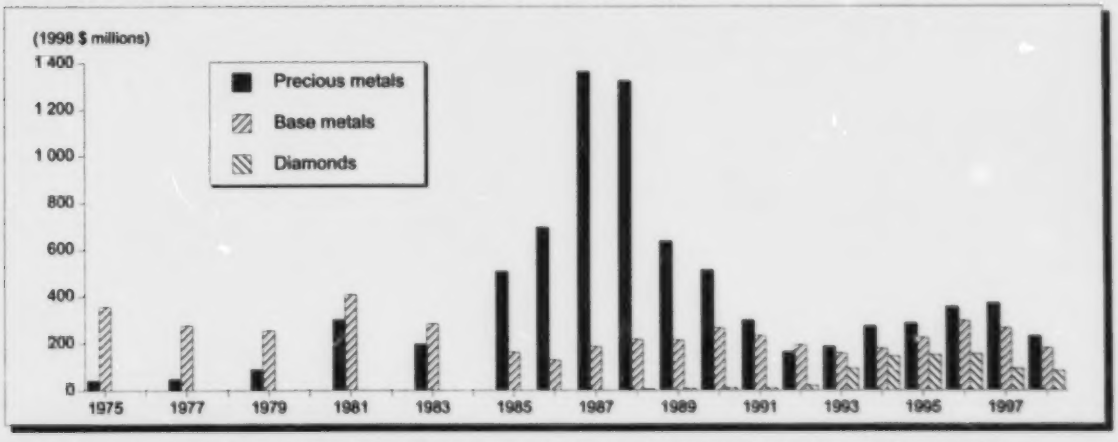
Precious metals exploration and deposit appraisal expenditures declined by 39.9% to $243 million in 1998, down from $404.6 million in 1997 (Table 12). This type of exploration represented only 37.0% of total Canadian expenditures in 1998 compared to 43.9% in 1997. Despite this decline, for the sixth year in a row, precious metals expenditures exceeded those of base metals. Exploration accounted for 70.6% of total precious metals expenditures in 1998 and deposit appraisal accounted for 29.4% (Tables 13a,13b and 13c).

Base-metal exploration and deposit appraisal expenditures fell by 32.7% in 1998 to $192.1 million from $285.6 million in 1997 (Table 12). A major reason for this decline was the suspension of activities at the major nickel development at Voisey's Bay in Labrador. Base-metal activities accounted for 29.3% of total Canadian exploration and deposit appraisal expenditures in 1998. Approximately 77.4% of the total base-metal expenditures were allocated to exploration activities and the remaining 22.6% went to deposit appraisal.

Diamond exploration and deposit appraisal expenditures increased to $119.1 million in 1996, up 6% from $112.4 million in 1997 (Table 12). Progress continued to advance the potential Diavik diamond mine in the Northwest Territories towards a development decision during the year. Spending on diamonds accounted for 18.2% of all exploration and deposit appraisal expenditures in Canada during 1998. Exploration activities accounted for 72.3% and deposit appraisal spending accounted for 27.7% of total diamond expenditures.

All other mineral commodities accounted for $101.7 million of exploration and deposit appraisal expenditures in Canada during 1998, down from $118.4 million in 1997 and about 15.5% of total Canadian exploration and deposit appraisal expenditures.

Figure 5
Exploration plus Deposit Appraisal, Field Work Plus Overhead Expenditures,[1] for Base Metals, Precious Metals and Diamonds, 1975-98



Sources: Natural Resources Canada and Statistics Canada, from a federal-provincial-territorial survey of mining and exploration companies.
[1] Includes on-mine-site plus off mine-site expenditures; 1997 and 1998 expenditures include both exploration plus deposit appraisal as per new definitions; up to and including 1996, most of the expenditures now included in the deposit appraisal work phase were under exploration (broadly speaking).
Note: Data have not been compiled for the years 1976, 1978, 1980, 1982 and 1984.

Expenditures on uranium represented some 50.6% of this total. Approximately 55.6% of these expenditures were directed at exploration activities and 44.4% at deposit appraisal activities (Tables 13a and 13b).

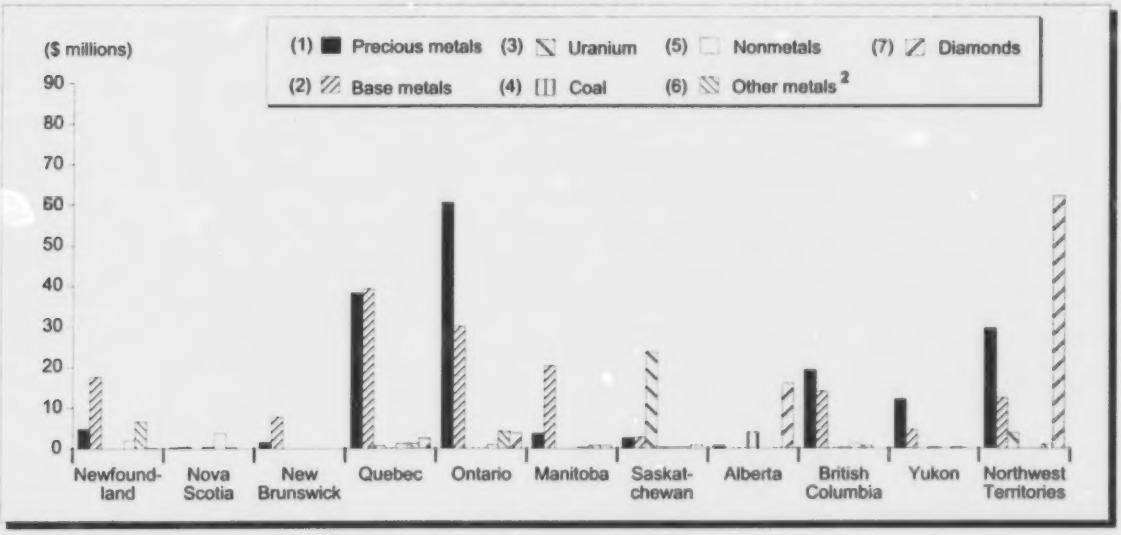
Provincial and Territorial Exploration and Deposit Appraisal Expenditures by Mineral Commodity Sought, 1998

Continuing the trend of recent years, precious metals, primarily gold, remained the most sought after mineral commodities in Canada during 1998. Quebec was the leading recipient of exploration and deposit appraisal expenditures for precious metals at 30.3% ($73.5 million) followed closely by Ontario at 29.2% ($71.1 million) (Table 13c). The other leading jurisdictions were the Northwest Territories at 16.5% and British Columbia at 12.7%. All jurisdictions were down from 1997 spending levels for precious metals with the exception of New Brunswick, which saw activity rise from $1.4 million to $1.7 million in 1998. Expenditures for exploration for precious metals accounted for 70.4% of exploration spending in the Yukon, 60.9% in Ontario and 54.4% in British Columbia (Table 13a). Ontario continued to be the leading jurisdiction for precious metals exploration with $60.4 million, or 85%, of its exploration spending directed at that commodity category. Quebec was the leader for deposit appraisal spending with 79.7% of its total deposit appraisal spending for that commodity group (Table 13b, Figure 6b).

Base metals remained the second most sought after commodity grouping in 1998 with Quebec the leading recipient of exploration and deposit appraisal expenditures at 24.2% ($46.5 million) (Table 13c). The other leading jurisdictions were Ontario at 17.8% ($34.1 million), Newfoundland at 14.7% ($28.2 million), and Manitoba at 12.7% ($24.3 million). Exploration expenditures on base metals represented 84.5% of total exploration spending in New Brunswick, 79.6% in Manitoba and 47.5% in Quebec (Table 13a, Figure 6a). Manitoba and Newfoundland spent the highest proportions of their expenditures on base-metal deposit appraisal with 92.0% and 63.4% of their total deposit appraisal spending, respectively (Table 13b, Figure 6b).

The third most sought after commodity was diamonds. As in recent years, the largest amount of exploration and deposit appraisal spending on diamonds in Canada, $95.1 million, or 79.8%, occurred in the Northwest Territories (Table 13c, Figure 6c). This was followed by Alberta at 13.5% ($16.1 million), Ontario at 3.2% ($3.9 million), and Quebec at 2.1% ($2.5 million). In terms of exploration only, diamonds were the leading commodity sought in Alberta and the Northwest Territories, accounting for 78.7%

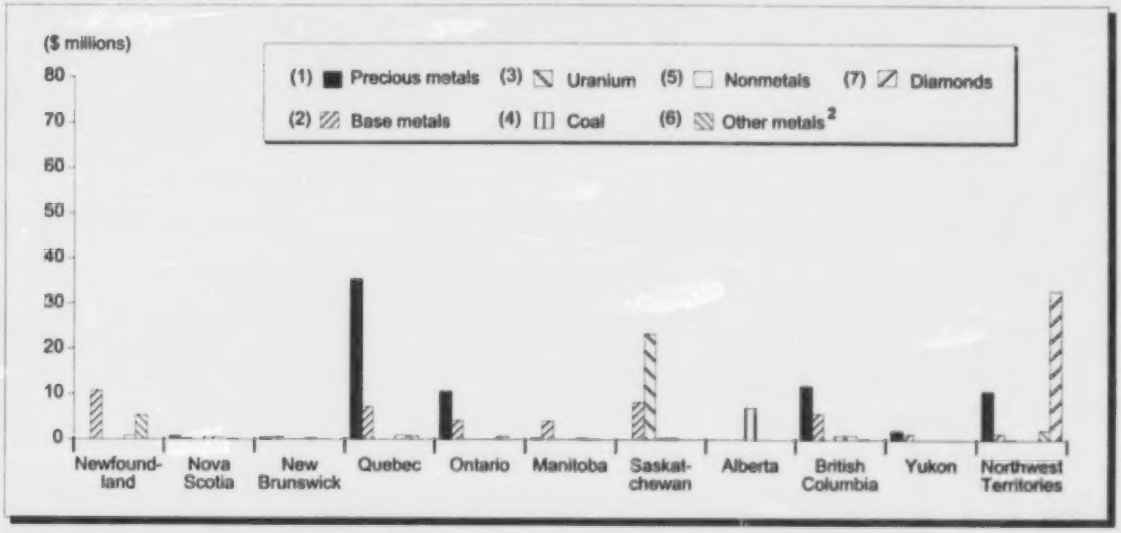
Figure 6a
Exploration Expenditures[1] by Province and Territory, by Mineral Commodity Sought, 1998



Source: Natural Resources Canada, from a federal-provincial-territorial survey of mining and exploration companies.

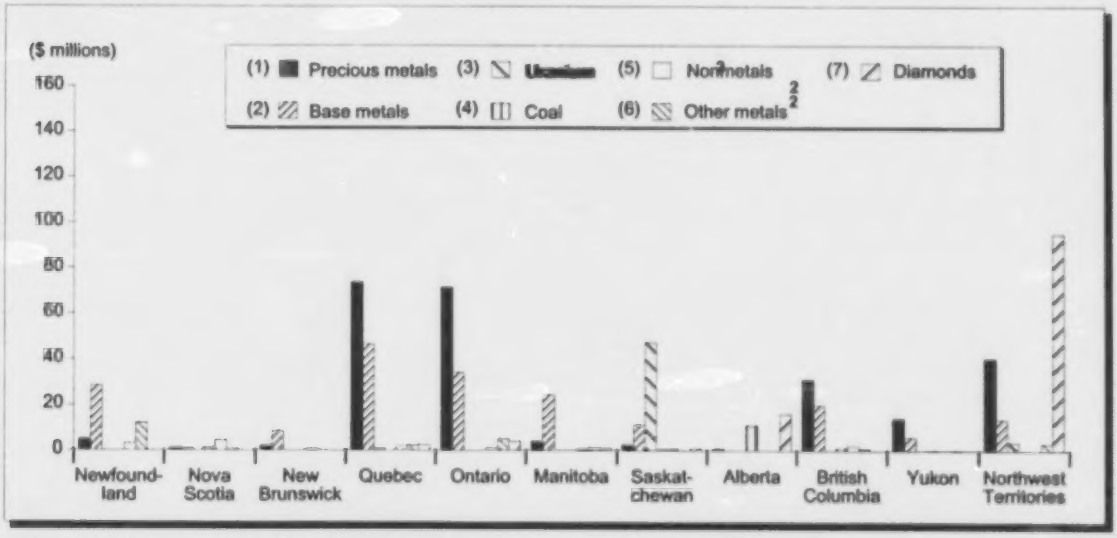
[1] Includes on-mine-site plus off-mine-site activities. Includes field work, overhead, engineering, economic and pre-feasibility studies, environment and land access expenditures. [2] Includes ferrous metals.

Figure 6b
Deposit Appraisal Expenditures[1] by Province and Territory, by Mineral Commodity Sought, 1998



Source: Natural Resources Canada, from a federal-provincial-territorial survey of mining and exploration companies.
[1] Includes on-mine-site plus off-mine-site activities. Includes field work, overhead, engineering, economic and pre- or production feasibility studies, environment and land access expenditures. [2] Includes ferrous metals.

Figure 6c
Exploration plus Deposit Appraisal Expenditures[1] by Province and Territory, by Mineral Commodity Sought, 1998



Source: Natural Resources Canada, from a federal-provincial-territorial survey of mining and exploration companies.
[1] Includes on-mine-site plus off-mine-site activities. Includes field work, overhead, engineering, economic and pre- or production feasibility studies, environment and land access expenditures. [2] Includes ferrous metals.

and 57.3% of total exploration spending respectively (Table 13a, Figure 6a). Almost all deposit appraisal spending on diamonds in Canada occurred in the Northwest Territories (Table 13b, Figure 6b).

Both uranium and coal had notable exploration and deposit appraisal activities in 1998. Most exploration and deposit appraisal expenditures for uranium took place in Saskatchewan where $47.1 million, or 91.5%, of spending occurred in 1998. This activity accounted for 75.9% of all exploration and deposit appraisal activity in that province. For coal, almost 82%, or $10.8 million, of the $13.2 million of exploration and deposit appraisal spending in 1998 took place in Alberta, especially during the deposit appraisal work phase. Another 8.1% was carried out in British Columbia and 5.7% in Nova Scotia.

In the nonmetals category (excluding diamonds), Nova Scotia at 32.9%, Newfoundland at 22.6%, Quebec at 16.3% and British Columbia at 16.1% accounted for most of the $12.9 million spent on exploration and deposit appraisal during 1998. For Nova Scotia, this represented 65.7% of all exploration and deposit appraisal activity in the province.

Exploration and Deposit Appraisal by Range of Expenditures and by Type of Company, 1998

Companies active in exploration and deposit appraisal in Canada are classified into six groups: (1) producers, (2) affiliates of producing mining companies, (3) oil companies, (4) foreign companies, (5) junior companies and prospectors, and (6) other companies. A company is classified into the first of these groups in which it fits. Seniors are covered by groups 1, 2, 3, 4 and 6.

Exploration and deposit appraisal spending by senior companies declined from $623 million in 1997 to $485.4 million in 1998 while the same spending by junior companies declined from $298 million in 1997 to $171 million in 1998 (Table 4). The share of total spending by juniors fell from 32.4% in 1997 to 26.0% in 1998.

Of the 604 active company project operators (excluding prospectors) in 1998, 91 (spending more than $1 million each) accounted for 84.1% of the total exploration and deposit appraisal expenditures of $655.9 million in 1998 (Table 4). This compares to 136 operators accounting for 86.0% in 1997. In 1998, 57 of these were senior companies (69 in 1997) representing 71% ($467.0 million) of all Canadian expenditures; 34 were junior companies (67 in 1997), representing 18% ($117.5 million).

Provincial and Territorial Exploration and Deposit Appraisal Expenditures by Type of Company, 1998

Producing companies and their affiliates spent $401 million, or 61.2%, of total exploration and deposit appraisal expenditures in Canada in 1998. On a provincial and territorial basis, these producers and their affiliates were the largest spending group in all provinces and territories with the exception of Nova Scotia and British Columbia, where junior companies were the largest spending group (Table 15c).

Junior companies had expenditures of $170.5 million, or 26.0%, of total Canadian spending. Of this total, 22.4% was spent in the Northwest Territories, 18.5% in Ontario, 16.5% in Quebec and 13.3% in British Columbia.

The foreign mining company group spent $51.4 million, or 7.8%, of the Canadian total. Of these expenditures, 81.3% was spent in the Northwest Territories and Alberta, also reflecting their involvement in diamond activities in these two jurisdictions.

The low level of exploration and deposit appraisal expenditures by oil companies continued in 1998 as their spending only amounted to $1.3 million, less than 1% of total Canadian activity. This continues the downward trend that began in the late 1970s. In 1977, oil companies accounted for nearly one quarter of all non-petroleum mineral exploration expenditures in Canada.

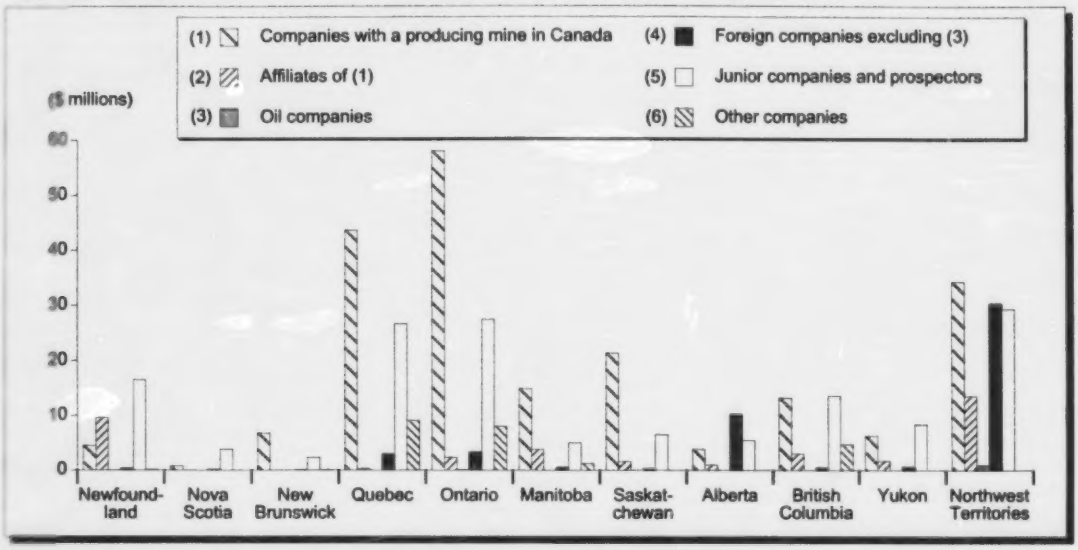
Figures 7a, 7b, and 7c show the expenditure patterns in 1998 for each work phase by province and territory, and type of company.

Exploration and Deposit Appraisal Expenditures by Type of Company and Mineral Commodity, 1998

In 1998, producing companies and their affiliates directed 33.9% ($135.9 million) of their $401.3 million of exploration and deposit appraisal expenditures at precious metals, 32.5% ($130.4 million) at base metals, 15.1% ($60.5 million) at diamonds, 11.4% ($45.6 million) at uranium, and 3.0% each at other metals and coal (Table 14c).

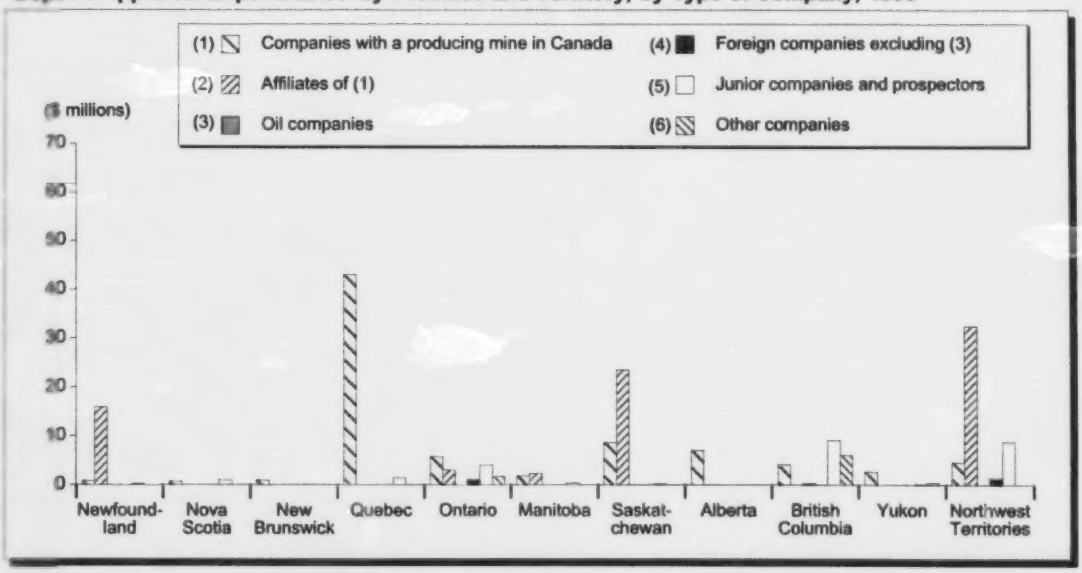
Juniors in 1998 mainly directed 42.5% ($72.5 million) of exploration and deposit appraisal expenditures at precious metals, 25.9% ($44.2 million) at base metals, 16.6% ($28.3 million) at diamonds, and 6.0% ($10.2 million) at other metals.

Figure 7a
Exploration Expenditures[1] by Province and Territory, by Type of Company, 1998



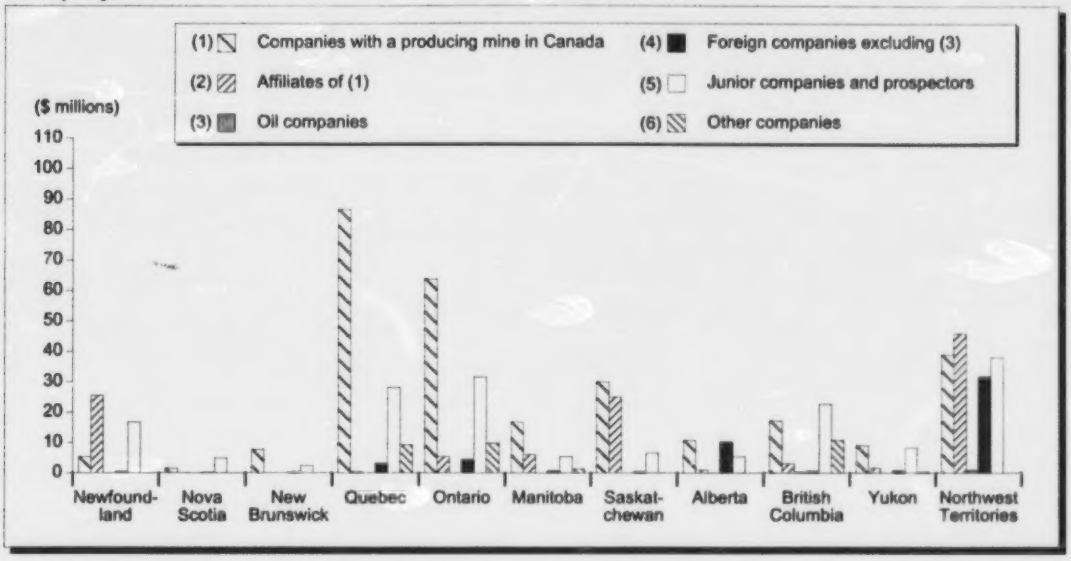
Source: Natural Resources Canada, from a federal-provincial-territorial survey of mining and exploration companies.
[1] Includes on-mine-site plus off-mine-site activities. Includes field work, overhead, engineering, economic and pre-feasibility studies, environment and land access expenditures.

Figure 7b
Deposit Appraisal Expenditures[1] by Province and Territory, by Type of Company, 1998



Source: Natural Resources Canada, from a federal-provincial-territorial survey of mining and exploration companies.
[1] Includes on-mine-site plus off-mine-site activities. Includes field work, overhead, engineering, economic and pre- or production feasibility studies, environment and land access expenditures.

Figure 7c
Exploration Plus Deposit Appraisal Expenditures,[1] by Province and Territory, by Type of Company, 1998



Source: Natural Resources Canada, from a federal-provincial-territorial survey of mining and exploration companies.
[1] Includes on-mine-site plus off-mine-site activities. Includes field work, overhead, engineering, economic and pre- or production feasibility studies, environment and land access expenditures.

Foreign companies, excluding oil companies, out of their $51.4 million of exploration and deposit appraisal spending in 1998, targeted 58.9% ($30.3 million) at diamonds, 27.9% ($14.3 million) at precious metals, and 12.8% ($6.6 million) at base metals.

Figures 8a, 8b and 8c show the expenditure patterns in 1998 for each work phase by type of company and mineral commodity.

Background Information on Mineral Development Statistics

Natural Resources Canada (NRCan) coordinates the collection of all statistics for off-mine-site and on-mine-site expenditures for the exploration and deposit appraisal phases and the mine complex development phase. Statistics Canada coordinates the collection of detailed on-mine-site statistics on capital, repair and maintenance expenditures reported by producers at the mine complex development phase. NRCan and Statistics Canada cooperate with the provinces and territories to collect, assemble and publish the comprehensive national mineral development statistics presented in this review. These are compiled from the annual federal-provincial-territorial Survey of Mineral Exploration, Deposit Appraisal and Mine Complex Development Expenditures. To protect the confidential data provided by respondents, only aggregate statistics are released.

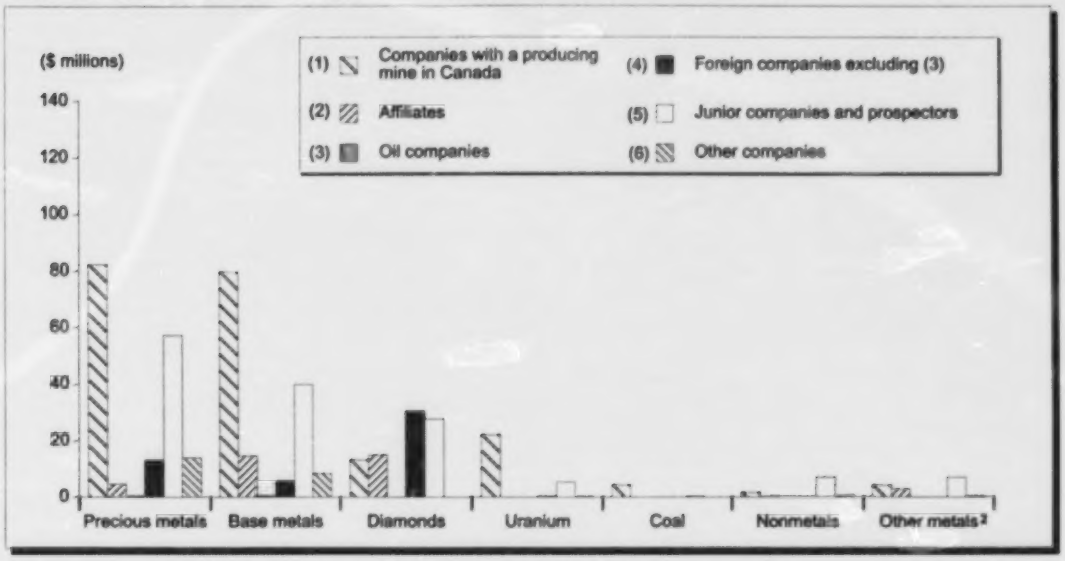
New definitions of work phases for mineral development were introduced in the 1997 survey. They provide a more complete and accurate coverage of mineral development expenditures in Canada from exploration to mine production. The Appendix describes the mineral development cycle upon which the new definitions are based. Specific definitions by category of expenditures are available on the exploration web site (http://www.nrcan.gc.ca/mms/efab/mmsd/exploration/default.html).

Notes: (1) Information in this review was current as of June 1, 2000. (2) This and other reviews, including previous editions, are available on the Internet at http://www.nrcan.gc.ca/mms/cmy/index_e.html.

Note to Readers

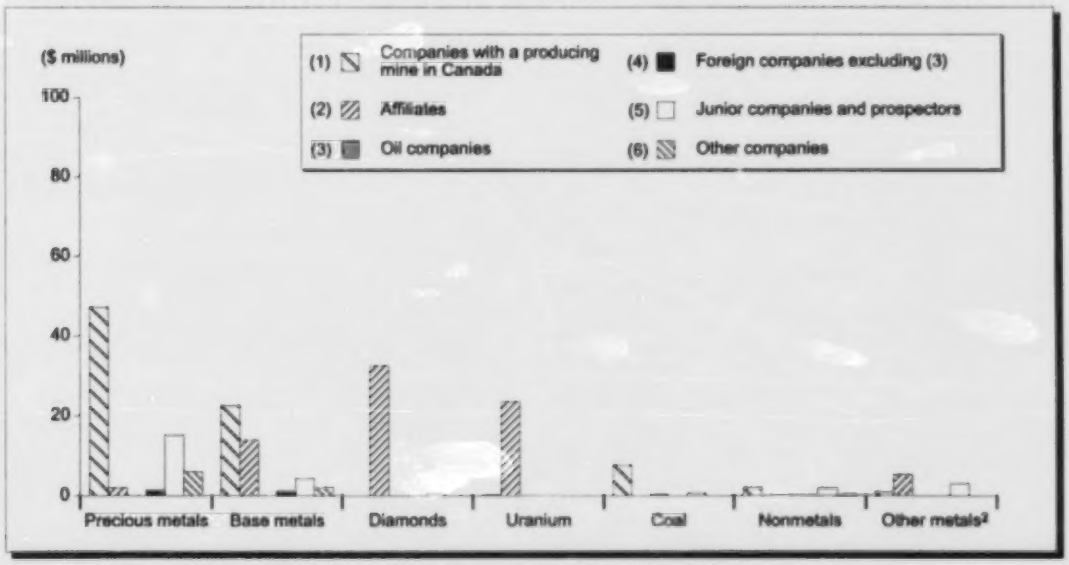
The intent of this document is to provide general information and to elicit discussion. It is not intended as a reference, guide or suggestion to be used in trading, investment, or other commercial activities. The author and Natural Resources Canada make no warranty of any kind with respect to the content and accept no liability, either incidental, consequential, financial or otherwise, arising from the use of this document.

Figure 8a
Exploration Expenditures[1] by Type of Company and Mineral Commodity, 1998



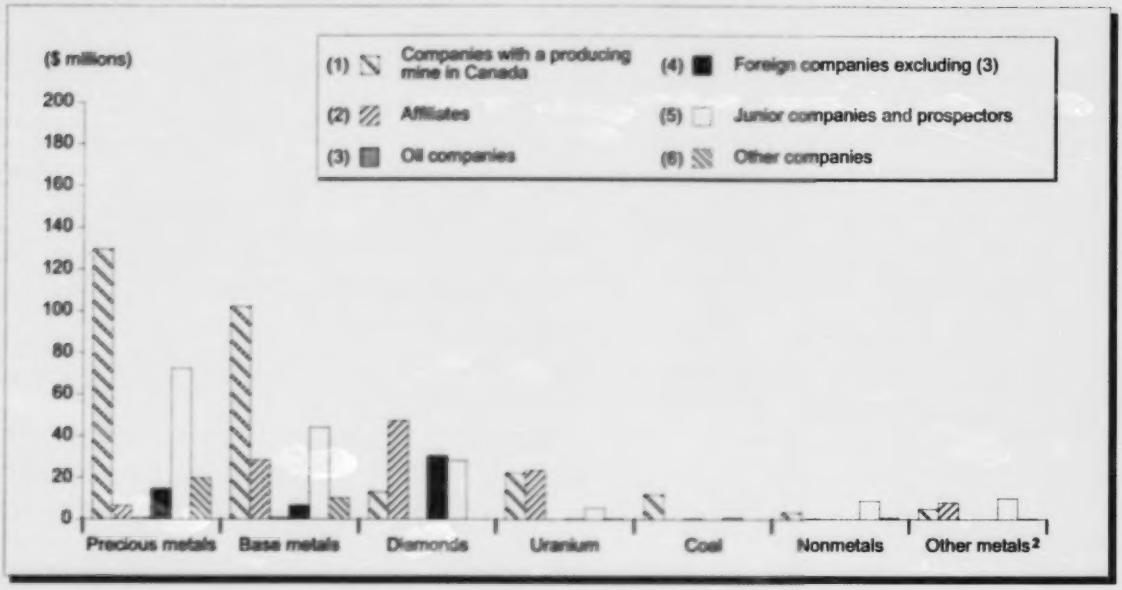
Source: Natural Resources Canada, from a federal-provincial-territorial survey of mining and exploration companies.
[1] Includes on-mine-site plus off-mine-site activities. Includes field work, overhead, engineering, economic and pre-feasibility studies, environment and land access expenditures. [2] Includes ferrous metals.

Figure 8b
Deposit Appraisal Expenditures[1] by Type of Company and Mineral Commodity, 1998



Source: Natural Resources Canada, from a federal-provincial-territorial survey of mining and exploration companies.
[1] Includes on-mine-site plus off-mine-site activities. Includes field work, overhead, engineering, economic and pre- or production feasibility studies, environment and land access expenditures. [2] Includes ferrous metals.

Figure 8c
Exploration Plus Deposit Appraisal Expenditures,[1] by Type of Company and Mineral Commodity, 1998



Source: Natural Resources Canada, from a federal-provincial-territorial survey of mining and exploration companies.
[1] Includes on-mine-site plus off-mine-site activities. Includes field work, overhead, engineering, economic and pre- or production feasibility studies, environment and land access expenditures. [2] Includes ferrous metals.

APPENDIX
Generalized Model of the Mineral Resource Development and Mining Process

PHASE	MINERAL RESOURCE ASSESSMENT	MINERAL EXPLORATION					MINERAL DEPOSIT APPRAISAL				MINE COMPLEX DEVELOPMENT	MINE PRODUCTION	ENVIRONMENTAL RESTORATION
		GRASSROOTS EXPLORATION											
STAGE	MRA	EX-1	EX-2	EX-3	EX-4	EX-5	DA-1	DA-2	DA-3	DA-4	MCD	MP	ER
	Various surveys, research and synthesis.	Exploration planning.	Regional reconnaissance and surveys.	Prospecting and ground surveys of anomalies.	Verification of anomalies and showings.	Discovery and delimitation of a mineral deposit.	Mineral deposit definition.	Project engineering.	Project economics.	Feasibility study, production decision.	Mine development, construction of processing plant and infrastructure.	Production, marketing and renewal of reserves.	Mine complex closure and decommissioning, site restoration.
OBJECTIVE	Supply information and tools required to develop the mineral potential of the nation for economic benefit, in the perspective of sustainable development.	Select target commodities. Establish exploration objectives and strategies. Select target areas and sites. Acquire claims or permits if appropriate.	Seek anomalies of interest over wide areas by various survey methods. Select the more promising targets. Acquire claims or permits.	Confirm the presence, exact location and characteristics of anomalies. Acquire claims, leases and properties.	Investigate the cause of anomalies. Find mineral showings. Acquire additional claims, leases and properties.	Discover, delimit and interpret grade quality and tonnage of a new mineral deposit. Determine if it constitutes a mineral resource of "potential economic interest", to justify more intensive and detailed work.	Define the limits, controls and internal distribution of grades, mineralogy and mineral processing characteristics of the deposit. Acquire all data required for project engineering and cost estimation.	Determine, in an iterative fashion, the design, plans, schedules, capital cost and operating cost estimates for all aspects of the project. Establish technical feasibility and costs thoroughly and realistically.	Obtain all the information required and determine, based on corporate objectives, parameters for the economic, financial and social-political evaluation of the project.	Diligently validate and integrate project data, interpretations, estimations, plans and evaluations to achieve MCD and production objectives. Decide on whether to undertake the mining project. Obtain permits and financing.	Complete mine development and construction on schedule and within budgets and specifications. Ensure efficient and timely mine complex start-up according to schedule, specifications and cash flow forecasts.	Achieve commercial production on schedule and meet cash flow forecasts and quantity and quality specifications. Achieve mine profitability and company survival in the perspective of sustainable development.	Restore mine site, outside plant and infrastructure to environmentally acceptable condition. Ensure the future quality of the environment.
EVALUATION METHODS	Geoscientific, mineral and economic surveys, research, compilations and synthesis by governments, research institutes, universities and industry.	Metal and mineral market research. Review of geological and ore deposit information and of the legal, fiscal and socio-political context in various areas.	Remote sensing, aerial photography and airborne geophysics. Prospecting, geology and geochemistry. Appraisal, rating and selection of anomalies.	Ground, geological, geochemical and geophysical prospecting and surveys. Compilation, appraisal and selection of significant anomalies.	Geological mapping and other surveys. Trenching, drilling and sampling. Appraisal of results, recommendations for further work, and selection of new targets.	Stripping, trenching, mapping, sampling, drilling and down-hole geophysics. Initial mineral processing tests. Environmental and site surveys. Mineral resource estimation and inventory.	Detailed mapping, sampling and drilling on surface or from underground. Systematic mineralogy and mineral processing tests. Detailed environmental and site surveys. Pre-feasibility studies.	Pilot tests, engineering design and planning. Capital and operating costs for mining, mineral processing, infrastructure, environmental protection and restoration. Technical risk analysis. Pre-feasibility studies.	Market, prices, product development and financial studies. Environmental, economic, financial, and socio-political risk analysis. Pre-feasibility studies.	Exhaustive due diligence review of all data, interpretations, plans and estimates. Evaluation of profitability, given the geological, technical, financial and qualitative risks, and the up-side factors.	Project management methods in a quality assurance perspective. Training program for personnel and detailed start-up plan to meet the requirements of this demanding period.	Production management methods to ensure continuous quality and efficiency improvements. Exploration, deposit appraisal and development of new zones or deposits on-mine-site and off-mine-site.	Mine closure and decommissioning. Environmental restoration and monitoring.
RESULTS	Maps, data bases, tools and models.	Exploration projects.	Regional anomalies.	Local anomalies.	Mineral showings.	Mineral deposit.	Deposit appraisal project.			Mining project.	Mining complex.	Mineral production.	Restored site.
MINERAL INVENTORY	UNDISCOVERED MINERAL POTENTIAL				INFERRED RESOURCE	DELIMITED MINERAL RESOURCE				MINERAL RESERVE			
	SPECULATIVE		HYPOTHETICAL			INDICATED	INDICATED AND MEASURED			PROVEN AND PROBABLE			
ESTIMATION ERROR (targeted margin of error of tonnage/grade estimates at the 90% confidence level)					+/- 100%	+/- 50%	Indicated: +/- 50 to 30% – Measured: +/- 20 to 10% (often several sample grid dimensions are used in each category)			Proven (feasibility: +/- 10%; mining: +/- 5%)			Full compliance
INVESTMENTS	Moderate	Low, but increasing multiple investments.					Larger and increasing multiple investments.			Very large industrial investment.			
RISK LEVEL	Low	Very high, but decreasing risk of failure and financial loss.					High, but decreasing risk of failure.			Moderate to low industrial risk.			

Sources: Modified by D.A. Cranstone, A. Lemieux and M. Vallée, February 25, 1994, from M. Vallée, 1992, *Guide to the Evaluation of Gold Deposits*, CIM Special Volume 45, p. 4, and *SOQUEM Annual Report*, 1976-77, pp. 4 and 5. Revised by M. Vallée, January 2001.

TABLE 1a. COMPARISON OF 1997 AND 1998 EXPENDITURES,[1] ON- AND OFF-MINE-SITE ACTIVITY FOR EXPLORATION, DEPOSIT APPRAISAL AND MINE COMPLEX DEVELOPMENT

Expenditure Category	1997					1998				
	Off-Mine-Site		On-Mine-Site		Total	Off-Mine-Site		On-Mine-Site		Total
	($ millions)	(%)	($ millions)	(%)	($ millions)	($ millions)	(%)	($ millions)	(%)	($ millions)
EXPLORATION										
Field work and overhead	543.3	90.6	56.0	9.4	599.3	385.9	86.7	59.2	13.3	445.1
New expenditures[1]	28.7	81.9	6.3	18.1	35.1	9.0	50.9	8.7	49.1	17.8
Subtotal	572.0	90.2	62.4	9.8	634.4	394.9	85.3	67.9	14.7	462.8
Capital[2]	25.2	97.9	0.5	2.1	25.7	7.8	80.4	1.9	19.6	9.7
Repair and maintenance[2]	5.1	100.0	–	–	5.1	1.2	25.2	3.6	74.8	4.8
DEPOSIT APPRAISAL										
Field work and overhead	123.8	56.1	97.1	43.9	220.8	73.2	55.9	57.7	44.1	130.9
New expenditures[1]	57.2	87.0	8.5	13.0	65.7	58.4	93.8	3.9	6.2	62.3
Subtotal	181.0	63.1	105.6	36.9	286.6	131.6	68.1	61.5	31.9	193.1
Capital[2]	134.5	91.3	12.9	8.7	147.4	16.4	65.4	8.7	34.6	25.1
Repair and maintenance[2]	23.0	45.3	27.8	54.7	50.8	11.6	64.6	6.4	35.3	18.0
EXPLORATION PLUS DEPOSIT APPRAISAL										
Field work and overhead	667.1	81.3	153.1	18.7	820.2	459.1	79.7	116.8	20.3	575.9
New expenditures[1]	85.9	85.2	14.9	14.8	100.8	67.4	84.3	12.6	15.7	80.0
Subtotal	753.0	81.8	168.0	18.2	921.0	526.5	80.3	129.4	19.7	655.9
Capital[2]	159.7	92.2	13.4	7.8	173.2	24.2	69.6	10.6	30.4	34.8
Repair and maintenance[2]	28.1	50.2	27.8	49.8	55.9	12.9	56.3	10.0	43.7	22.8
MINE COMPLEX DEVELOPMENT										
Field work and overhead	n.a.	n.a.	834.0	100.0	834.0	n.a.	n.a.	932.3	100.0	932.3
New expenditures[1]	n.a.	n.a.	31.5	100.0	31.5	n.a.	n.a.	33.8	100.0	33.8
Subtotal	n.a.	n.a.	865.5	100.0	865.5	n.a.	n.a.	966.1	100.0	966.1
Capital[2]	n.a.	n.a.	2 089.6	100.0	2 089.6	n.a.	n.a.	1 226.3	100.0	1 226.3
Repair and maintenance[2]	n.a.	n.a.	1 578.3	100.0	1 578.3	n.a.	n.a.	1 671.6	100.0	1 671.6
Total	n.a.	n.a.	4 742.6	n.a.	5 683.5	n.a.	n.a.	4 014.0	n.a.	4 577.6

Sources: Natural Resources Canada and Statistics Canada, from a federal-provincial-territorial survey of mining and exploration companies.
– Nil; n.a. Not applicable.
[1] Includes engineering, economic and pre- or production feasibility studies, environment and land access expenditures. [2] Includes construction, and machinery and equipment expenditures, and related environmental protection and restoration expenditures.
Note: Numbers may not add to totals due to rounding.

TABLE 1b. SUMMARY OF 1998 EXPENDITURES NOT PREVIOUSLY RECORDED

Expenditure Category	Total
	($ millions)
EXPLORATION PLUS DEPOSIT APPRAISAL	
Environment	31.7
Engineering, economic and pre- or production feasibility studies	44.6
Land access	3.7
Subtotal	80.0
Capital	34.8
Repair and maintenance	22.8
Total	137.6
MINE COMPLEX DEVELOPMENT	
Environment	10.0
Engineering, economic and pre- or production feasibility studies	19.0
Land access	4.8
Total	33.8
Grand total	171.4

Source: Natural Resources Canada, from a federal-provincial-territorial survey of mining and exploration companies.
Note: See Tables 1a and 2a for more information.

TABLE 2a. EXPLORATION, DEPOSIT APPRAISAL AND MINE COMPLEX DEVELOPMENT EXPENDITURES[1], 1998

Expenditure Category	Exploration	Deposit Appraisal	Exploration Plus Deposit Appraisal	Mine Complex Development	Total
			($000)		
Field work and overhead[2]	445 055	130 865	575 920[a]	932 290	1 508 209
Engineering studies	2 847	34 059	36 906	11 152	48 058
Economic studies	306	661	967	452	1 419
Pre- or production feasibility studies	1 698	5 053	6 751	7 427	14 178
Environment	11 294	20 373	31 667	9 958	41 625
Land access	1 605	2 115	3 720	4 783	8 503
Subtotal	462 805	193 126	655 931	966 061	1 621 992
Off-mine-site[3]	394 929	131 591	526 520	n.a.	526 520
On-mine-site[3]	67 875	61 535	129 411	966 061	1 095 472
Capital[4]	9 697	25 103	34 800	1 226 347	1 261 147
Total	472 501	218 230	690 731	2 192 409	2 883 139
Repair and maintenance[4]	4 838	17 995	22 832	1 671 588	1 694 420
Grand total	477 339	236 224	713 563	3 863 997	4 577 560

Source: Natural Resources Canada, from a federal-provincial-territorial survey of mining and exploration companies.
n.a. Not applicable.
[a] This total can be compared to some extent with exploration expenditures prior to 1997.
[1] Includes on-mine-site plus off-mine-site activities; exploration and deposit appraisal activities include only the search for and appraisal of deposits and do not include work for extensions of known reserves. [2] Overhead expenditures include mineral leases, claims and rental costs, and project-related head office expenditures. [3] Amount of expenditures dedicated to off-mine-site and on-mine-site activities. [4] Includes construction and machinery and equipment expenditures.
Note: Numbers may not add to totals due to rounding.

TABLE 2b. SUMMARY OF ENVIRONMENT EXPENDITURES FOR EXPLORATION, DEPOSIT APPRAISAL AND MINE COMPLEX DEVELOPMENT, 1998

Expenditure Category	Exploration		Deposit Appraisal		Exploration Plus Deposit Appraisal		Mine Complex Development		Grand Total[1]	
	($000)	(%)	($000)	(%)	($000)	(%)	($000)	(%)	($000)	(%)
Environment										
Characterization	3 201	27.0	8 917	41.2	12 118	36.2	651	0.5	12 768	7.5
Permits	5 164	43.6	7 462	34.5	12 626	37.7	520	0.4	13 146	7.7
Protection	1 261	10.7	2 422	11.2	3 684	11.0	6 319	4.6	10 003	5.9
Restoration	1 667	14.1	1 572	7.3	3 240	9.7	2 469	1.8	5 708	3.3
Subtotal	11 294		20 373		31 667		9 958		41 625	
Capital, share of environment	157	1.3	144	0.7	301	0.9	23 783	17.3	24 084	14.1
Repair and maintenance, share of environment	390	3.3	1 120	5.2	1 510	4.5	103 765	75.5	105 276	61.6
Total environment	11 841	100.0	21 638	100.0	33 479	100.0	137 506	100.0	170 985	100.0
Total environment as a percentage of grand total[1]		2.5		9.2		4.7		3.6		3.7

Source: Natural Resources Canada, from a federal-provincial-territorial survey of mining and exploration companies.
[1] Grand total refers to Table 2a.
Note: Numbers may not add to totals due to rounding.

TABLE 2c. EXPLORATION, DEPOSIT APPRAISAL AND MINE COMPLEX DEVELOPMENT EXPENDITURES,[1] 1999 AND 2000

Expenditure Category	Exploration		Deposit Appraisal		Exploration Plus Deposit Appraisal		Mine Complex Development		Grand Total	
	1999	2000	1999	2000	1999	2000	1999	2000	1999	2000
					($000)					
Field work and overhead[2]	327 446	298 996	98 475	95 892	425 921[a]	394 888[a]	724 819	700 527	1 150 740	1 095 415
Engineering, economic and pre- or production feasibility studies	5 010	6 665	46 146	76 559	51 156	83 224	20 891	17 210	72 046	100 434
Environment	7 479	7 683	10 984	11 187	18 463	18 870	9 267	9 989	27 729	28 859
Land access	1 292	1 555	4 262	3 571	5 554	5 126	8 274	7 727	13 828	12 853
Subtotal	341 226	314 899	159 867	187 209	501 094	502 108	763 250	735 453	1 264 344	1 237 562
Off-mine-site	287 502	269 692	120 436	158 361	407 937	428 053	n.a.	n.a.	407 937	428 053
On-mine-site	53 725	45 207	39 431	28 848	93 156	74 055	763 250	735 453	856 407	809 508
Capital[3]	3 227	607	26 978	41 376	30 205	41 983	813 649	886 188	843 854	928 171
$ for environmental protection and restoration[4]	–	13	102	178	102	191	25 742	43 351	25 844	43 542
Repair and maintenance[3]	4 105	1 337	28 971	37 247	33 076	38 584	1 217 103	1 134 538	1 250 179	1 173 122
$ for environmental protection and restoration[4]	–	–	493	150	493	150	59 757	60 265	60 250	60 415
Subtotal	7 332	1 944	55 949	78 623	63 281	80 567	2 030 753	2 020 726	2 094 034	2 101 292
Grand total	348 558	316 843	215 816	265 832	564 375	582 675	2 794 003	2 756 179	3 358 377	3 338 854
Total environment	7 479	7 696	11 579	11 515	19 058	19 211	94 765	113 605	113 823	132 816
Environment as a percentage of grand total	2.1	2.4	5.4	4.3	3.4	3.3	3.4	4.1	3.4	4.0

Source: Natural Resources Canada, from a federal-provincial-territorial survey of mining and exploration companies.
– Nil; n.a. Not applicable.
[a] This total can be compared to some extent with exploration expenditures prior to 1997.
[1] Incudes on-mine-site plus off-mine-site activities; exploration and deposit appraisal activities include only the search for and appraisal of deposits and do not include work for extensions of known reserves. [2] Overhead expenditures include mineral leases, claims and rental costs, and project-related head office expenditures. [3] Includes construction, and machinery and equipment expenditures.
[4] As part of capital expenditures or repair and maintenance expenditures.
Notes: Numbers may not add to totals due to rounding. Data for 1999 are preliminary estimates; data for 2000 are company spending intentions.

TABLE 3. EXPLORATION PLUS DEPOSIT APPRAISAL, FIELD WORK PLUS OVERHEAD EXPENDITURES,[1] BY JUNIOR AND SENIOR COMPANIES, 1969-2000

	Current Dollars				Constant 1999 Dollars		
	Share of Total			% of Total	Share of Total		
Year	Junior	Senior	Total	Junior	Junior	Senior	Total
	($ millions)				($ millions)		
1969	44.4	130.5	174.9	25.4	197.0	579.0	776.0
1970	39.9	147.2	187.1	21.3	168.8	622.6	791.4
1971	24.5	127.5	152.0	16.1	100.1	521.0	621.1
1972	18.3	97.4	115.7	15.8	70.5	375.4	446.0
1973	22.5	121.6	144.1	15.6	79.4	429.2	508.6
1974	21.8	158.5	180.3	12.1	67.1	488.1	555.2
1975	19.5	187.8	207.3	9.4	54.4	523.4	577.8
1976	13.9	192.9	206.8	6.7	35.5	492.2	527.7
1977	12.5	271.0	283.5	4.4	29.9	647.4	677.3
1978	19.8	275.0	294.8	6.7	44.4	616.3	660.7
1979	29.4	329.5	358.9	8.2	60.2	674.5	734.7
1980	60.2	530.0	590.2	10.2	111.1	978.1	1 089.2
1981	83.0	651.2	734.2	11.3	138.0	1 082.3	1 220.3
1982	73.8	502.5	576.3	12.8	113.0	769.3	882.3
1983	71.2	400.6	471.8	15.1	103.5	582.2	685.6
1984	146.9	470.4	617.3	23.8	206.6	661.5	868.1
1985	181.1	424.7	605.8	29.9	248.6	582.8	831.4
1986	348.6	374.7	723.3	48.2	465.6	500.3	965.9
1987	668.2	631.8	1 300.0	51.4	851.5	805.1	1 656.6
1988	668.3	681.8	1 350.0	49.5	814.4	830.8	1 645.1
1989	272.6	555.3	827.9	32.9	317.6	647.0	964.6
1990	241.0	533.7	774.7	31.1	272.6	603.7	876.3
1991	116.1	415.6	532.0	21.8	127.9	457.7	585.9
1992	79.9	305.4	385.3	20.7	86.9	332.0	418.8
1993	142.7	334.5	477.3	29.9	152.9	358.3	511.1
1994	195.8	432.3	628.1	31.2	207.4	458.0	665.4
1995	213.4	504.2	717.6	29.7	221.1	522.5	743.6
1996	314.7	580.0	894.8	35.2	320.9	591.5	912.4
1997	266.7	553.5	820.2	32.5	269.7	559.7	829.3
1998	155.9	420.0	575.9	27.1	158.5	427.1	585.6
1999p	120.5	305.4	425.9	28.3	120.5	305.4	425.9
2000f	141.4	253.5	394.9	35.8	138.5	248.2	386.7

Sources: Natural Resources Canada and Statistics Canada, from a federal-provincial-territorial survey of mining and exploration companies.
f Forecast; p Preliminary.
1 Includes on-mine-site plus off-mine-site activities.
Note: Expenditures starting in 1997 include both exploration plus deposit appraisal as per new definitions; up to and including 1996, most of the expenditures now included in the deposit appraisal work phase were reported under exploration (broadly speaking).

TABLE 4. EXPLORATION PLUS DEPOSIT APPRAISAL EXPENDITURES,[1] BY RANGE OF EXPENDITURES AND BY JUNIOR AND SENIOR COMPANIES, 1997, 1998 AND 1999

Range of Expenditures	Junior			Senior			Total		
	Companies	Expenditures	Percentage of Total Expenditures	Companies	Expenditures	Percentage of Total Expenditures	Companies	Expenditures	Percentage of Total Expenditures
($)	(number)	($000)	(%)	(number)	($000)	(%)	(number)	($000)	(%)
1997									
>10 million	1	12 035	4.0	20	403 654	64.8	21	415 689	45.1
5 million - 10 million	8	53 448	17.9	17	114 501	18.4	25	167 949	18.2
1 million - 5 million	58	127 443	42.8	32	81 120	13.0	90	208 563	22.6
500 000 - 1 million	65	46 439	15.6	19	14 006	2.2	84	60 445	6.6
200 000 - 500 000	105	34 736	11.7	22	7 130	1.1	127	41 865	4.5
100 000 - 200 000	83	12 230	4.1	8	1 060	0.2	91	13 290	1.4
50 000 - 100 000	50	3 880	1.3	13	1 064	0.2	63	4 944	0.5
0 - 50 000	159	2 970	1.0	24	474	0.1	183	3 445	0.4
Subtotal	529	293 181	98.4	155	623 009	100.0	684	916 190	99.5
Prospectors	65	4 780	1.6	–	–	–	65	4 780	0.5
Total 1997	594	297 961	100.0	155	623 009	100.0	749	920 970	100.0
1998									
>10 million	–	–	–	15	298 116	61.4	15	298 116	45.4
5 million - 10 million	3	23 878	14.0	13	98 355	20.3	16	122 233	18.6
1 million - 5 million	31	60 521	35.5	29	70 573	14.5	60	131 094	20.0
500 000 - 1 million	48	33 083	19.4	15	10 881	2.2	63	43 964	6.7
200 000 - 500 000	91	29 145	17.1	15	4 786	1.0	106	33 931	5.2
100 000 - 200 000	82	12 290	7.2	12	1 811	0.4	94	14 101	2.1
50 000 - 100 000	50	3 940	2.3	5	413	0.1	55	4 353	0.7
0 - 50 000	174	3 142	1.8	21	452	0.1	195	3 594	0.5
Subtotal	479	165 999	97.3	125	485 387	100.0	604	651 387	99.3
Prospectors	43	4 544	2.7	–	–	–	43	4 544	0.7
Total 1998	522	170 544	100.0	125	485 387	100.0	647	655 931	100.0
1999p									
>10 million	1	15 623	11.4	11	198 052	54.5	12	213 675	42.6
5 million - 10 million	1	5 100	3.7	12	88 419	24.3	13	93 519	18.7
1 million - 5 million	25	52 038	37.9	27	61 216	16.8	52	113 255	22.6
500 000 - 1 million	24	16 868	12.3	11	8 169	2.2	35	25 036	5.0
200 000 - 500 000	85	28 581	20.8	15	5 032	1.4	100	33 613	6.7
100 000 - 200 000	48	7 440	5.4	11	1 553	0.4	59	8 993	1.8
50 000 - 100 000	51	4 020	2.9	8	617	0.2	59	4 637	0.9
0 - 50 000	147	2 709	2.0	29	586	0.2	176	3 295	0.7
Subtotal	382	132 379	96.3	124	363 645	100.0	506	496 024	99.0
Prospectors	38	5 070	3.7	–	–	–	38	5 070	1.0
Total 1999	420	137 449	100.0	124	363 645	100.0	544	501 094	100.0

Source: Natural Resources Canada, from a federal-provincial-territorial survey of mining and exploration companies.
– Nil; p Preliminary.
1 Includes on-mine-site plus off-mine-site activities. Includes field work, overhead, engineering, economic and pre- or production feasibility studies, environment and land access expenditures.
Note: Numbers may not add to totals due to rounding.

TABLE 5a. DIAMOND EXPLORATION PLUS DEPOSIT APPRAISAL EXPENDITURES,[1] BY PROVINCE AND TERRITORY, 1997-99

Province/Territory	1997	1998	1999p
	Total Expenditures		
	($ millions)		
Northwest Territories	94.7	95.1	98.4
Alberta	9.5	16.1	10.8
Nunavut	n.a.	n.a.	9.5
Ontario	1.9	3.9	5.5
Quebec	2.6	2.5	0.9
Saskatchewan	2.5	0.8	0.7
Others	1.2	0.8	0.1
Total	112.4	119.1	125.8

Source: Natural Resources Canada, from a federal-provincial-territorial survey of mining and exploration companies.
n.a. Not applicable; p Preliminary.
1 Includes on-mine-site plus off-mine-site activities. Includes field work, overhead, engineering, economic and pre- or production feasibility studies, environment and land access expenditures.
Note: Numbers may not add to totals due to rounding.

TABLE 5b. SUMMARY OF TOTAL DIAMOND EXPLORATION, DEPOSIT APPRAISAL AND MINE COMPLEX DEVELOPMENT EXPENDITURES,[1] 1997-99

Expenditure Category	1997	1998	1999p
	($ millions)		
Field work and overhead	116.2	148.9	105.5
Engineering, economic and pre- or production feasibility studies, environment and land access	20.2	36.7	56.1
Capital and repair[2]	281.7	161.4	88.1
Total	418.1	347.1	249.7

Source: Natural Resources Canada, from a federal-provincial-territorial survey of mining and exploration companies.
p Preliminary.
1 Includes on-mine-site plus off-mine-site activities. 2 Includes construction, and machinery and equipment expenditures.
Note: Numbers may not add to totals due to rounding.

TABLE 6a. AREA[1] OF NEW MINERAL CLAIMS STAKED OR RECORDED IN CANADA, 1992-99

Province/Territory	1992		1993		1994		1995		1996		1997		1998		1999	
	(hectares)	(%)[2]	(hectares)	(%)[3]	(hectares)	(%)[4]	(hectares)	(%)[5]	(hectares)	(%)[6]	(hectares)	(%)[7]	(hectares)	(%)[8]	(hectares)	(%)[9]
Newfoundland	98 423	75.5	127 282	132.0	513 903	403.8	6 106 617	1188.3	417 575	6.8	334 075	80.0	361 900	108.3	241 075	66.6
Nova Scotia	205 941	162.4	87 350	42.4	154 123	176.4	183 883	119.3	424 815	231.0	208 191	49.0	74 180	35.6	157 394	212.2
New Brunswick	55 104	75.3	37 616	68.3	63 680	169.3	60 464	94.9	93 760	155.1	53 760	57.3	40 000	74.4	28 336	70.8
Quebec	555 323	121.6	691 915	124.6	840 922	121.5	1 474 196	175.3	954 967	64.8	1 050 629	110.0	728 142	69.3	754 102	103.6
Ontario	497 800	156.8	426 416	85.7	734 400	172.2	668 832	91.1	903 488	135.1	855 584	94.7	577 632	67.5	604 096	104.6
Manitoba	1 015 089[a]	936.3	831 165[b]	81.9	1 391 641[b]	167.4	670 316[b]	48.2	325 452[b]	48.6	386 243[b]	118.7	475 634	123.1	566 571	119.1
Saskatchewan	697 315	327.2	2 257 219	251.6	1 815 997	80.5	340 881	18.8	469 040	137.6	950 253	202.6	680 048	71.6	107 083	15.7
Alberta	22 300 000	506 818.2	10 280 000	46.0	6 750 000	65.6	1 665 000	24.7	5 328 000	320.0	37 200 000	698.2	3 490 000	9.4	1 026 000	29.4
British Columbia	824 200[a]	54.6	702 250	85.2	774 340	110.3	845 550	109.2	987 740	116.8	785 257	79.7	474 296	62.0	478 740	100.9
Yukon	135 854	106.1	114 817	84.5	280 171	244.0	376 844	134.5	514 483	136.5	459 507	89.3	131 221	28.5	152 731	116.4
Northwest Territories	7 178 000	324.3	11 812 417	164.6	2 929 482	24.8	3 839 299	131.1	2 956 017	77.0	1 953 191	66.1	827 615	42.4	354 755	129.6[10]
Nunavut	..	..	..	..	..	..	..	..	..	..	..	..	..	..	718 186	..
Total	33 761 046	632.1	27 348 450	81.0	16 248 659	59.4	16 231 892	99.9	13 385 337	82.5	44 216 690	330.3	7 860 668	17.8	5 189 069	66.0

Source: Provincial and territorial mining recorders.
.. Not available.
[a] Not strictly comparable to 1990 and earlier years because the total is the area of claims recorded and not the area of claims staked. [b] Data for Manitoba are revised.
[1] Excludes coal. [2] Percentage of 1992 over 1991. [3] Percentage of 1993 over 1992. [4] Percentage of 1994 over 1993. [5] Percentage of 1995 over 1994.
[6] Percentage of 1996 over 1995. [7] Percentage of 1997 over 1996. [8] Percentage of 1998 over 1997. [9] Percentage of 1999 over 1998. [10] Percentage based on new claims staked in 1999 in the Northwest Territories and Nunavut combined.
Note: Numbers may not add to totals due to rounding.

TABLE 6b. AREA[1] OF NEW MINERAL CLAIMS STAKED OR RECORDED IN CANADA, 1997-99

Province/Territory	1997		1998		1999	
	(hectares)	(%)	(hectares)	(%)	(hectares)	(%)
Newfoundland	334 075	0.8	361 900	4.6	241 075	4.6
Nova Scotia	208 191	0.5	74 180	0.9	157 394	3.0
New Brunswick	53 760	0.1	40 000	0.5	28 336	0.5
Quebec	1 050 629	2.4	728 142	9.3	754 102	14.5
Ontario	855 584	1.9	577 632	7.3	604 096	11.6
Manitoba	386 243[r]	0.9	475 634	6.1	566 571	10.9
Saskatchewan	950 253	2.2	680 048	8.7	107 083	2.1
Alberta	37 200 000	84.1	3 490 000	44.4	1 026 000	19.8
British Columbia	785 257	1.7	474 296	6.0	478 740	9.2
Yukon	459 507	1.0	131 221	1.7	152 731	2.9
Northwest Territories	1 953 191	4.4	827 615	10.5	354 755	6.8
Nunavut	..	..	..	..	718 186	13.8
Total	44 216 690	100.0	7 860 668	100.0	5 189 069	100.0

Source: Provincial and territorial mining recorders.
.. Not available. [r] Revised.
[1] Excludes coal.
Note: Numbers may not add to totals due to rounding.

TABLE 7. EXPLORATION AND DEPOSIT APPRAISAL, OFF-MINE-SITE AND ON-MINE-SITE EXPENDITURES,[1] BY PROVINCE AND TERRITORY, 1998 AND 1999

Province/Territory	1998						1999p					
	Exploration		Deposit Appraisal		Exploration Plus Deposit Appraisal		Exploration		Deposit Appraisal		Exploration Plus Deposit Appraisal	
	Off-Mine-Site	On-Mine-Site	Off-Mine-Site	On-Mine-Site	Off-Mine-Site	On-Mine-Site	Off-Mine-Site	On-Mine-Site	Off-Mine-Site	On-Mine-Site	Off-Mine-Site	On-Mine-Site
	($000)											
Newfoundland	29 081	1 917	16 103	755	45 183	2 672	27 233	504	3 965	924	30 696	1 428
Nova Scotia	4 675	–	1 763	34	6 438	34	3 553	–	638	–	4 192	–
New Brunswick	7 536	1 625	97	854	7 633	2 479	6 374	1 656	–	522	6 374	2 178
Quebec	73 226	9 424	4 008	40 415	77 234	49 839	71 469	13 551	6 729	17 327	78 198	30 878
Ontario	66 945	32 277	9 826	5 772	76 771	38 049	34 717	18 599	16 590	15 086	51 307	33 685
Manitoba	23 558	1 871	402	4 021	23 960	5 892	18 328	5 128	344	1 960	18 672	7 088
Saskatchewan	29 718	50	27 804	4 499	57 522	4 549	18 880	100	9 487	–	28 367	100
Alberta	18 555	1 883	5 150	1 878	23 705	3 760	13 690	–	2 429	1 633	16 119	1 633
British Columbia	29 047	5 993	17 358	2 118	46 405	8 110	28 315	2 932	10 527	414	38 842	3 346
Yukon	14 774	2 179	1 933	1 189	16 707	3 368	9 493	818	2 674	180	12 167	998
Northwest Territories	97 817	10 658	47 146	–	144 963	10 658	35 565	9 738	56 806	1 100	92 371	10 838
Nunavut	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	19 865	701	10 547	285	30 432	986
Total	394 929	67 875	131 591	61 535	526 520	129 411	287 502	53 725	120 436	39 431	407 937	93 156
Total (on- plus off-mine-site)	462 805		193 126		655 931		341 226		159 867		501 094	

Source: Natural Resources Canada, from a federal-provincial-territorial survey of mining and exploration companies.
– Nil; n.a. Not applicable; p Preliminary.
[1] Includes field work, overhead, engineering, economic and pre- or production feasibility studies, environment and land access expenditures.
Note: Numbers may not add to totals due to rounding.

TABLE 8. EXPLORATION PLUS DEPOSIT APPRAISAL EXPENDITURES,[1] BY PROVINCE AND TERRITOPY, 1997-2000

Province/Territory	1997		1998		1998 as a % of 1997 Expenditures	1999p		1999 as a % of 1998 Expenditures	2000f		2000 as a % of 1999 Expenditures
	($ millions)	(%)	($ millions)	(%)	(%)	($ millions)	(%)	(%)	($ millions)	(%)	(%)
Newfoundland	71.8	7.8	47.9	7.3	66.7	32.3	6.5	67.5	23.0	4.6	71.2
Nova Scotia	7.9	0.9	6.5	1.0	82.4	4.2	0.8	64.8	5.9	1.2	139.8
New Brunswick	13.4	1.5	10.1	1.5	75.6	8.6	1.7	84.6	8.5	1.7	98.9
Quebec	173.3	18.8	127.1	19.4	73.3	109.1	21.8	85.8	77.1	15.4	70.7
Ontario	189.3	20.6	114.8	17.5	60.7	85.0	17.0	74.0	101.6	20.2	119.6
Manitoba	41.4	4.5	29.9	4.6	72.2	25.8	5.1	86.3	25.0	5.0	97.0
Saskatchewan	56.1	6.1	62.1	9.5	110.5	28.5	5.7	45.9	35.0	7.0	122.9
Alberta	28.0	3.0	27.5	4.2	98.1	17.8	3.5	64.6	17.4	3.5	97.8
British Columbia	115.2	12.5	54.5	8.3	47.3	42.2	8.4	77.4	41.9	8.3	99.3
Yukon	45.6	5.0	20.1	3.1	44.0	13.2	2.6	65.6	11.8	2.4	89.7
Northwest Territories	179.1	19.4	155.6	23.7	86.9	103.2	20.6	86.5[2]	119.3	23.8	115.6
Nunavut	n.a.	n.a.	n.a.	n.a.	n.a.	31.4	6.3	n.a.	35.7	7.1	113.5
Total	921.0	100.0	655.9	100.0	71.2	501.1	100.0	76.4	502.1	100.0	100.2
Exploration	634.4	68.9	462.8	70.6	73.0	341.2	68.1	73.7	314.9	62.7	92.3
Deposit appraisal	286.6	31.1	193.1	29.4	67.4	159.9	31.9	82.8	187.2	37.3	117.1

Source: Natural Resources Canada, from a federal-provincial-territorial survey of mining and exploration companies.
f Forecast; n.a. Not applicable; p Preliminary.
1 Includes on-mine-site plus off-mine-site activities. Includes field work, overhead, engineering, economic and pre- or production feasibility studies, environment and land access expenditures.
2 The 1999 Northwest Territories compares the sum of Northwest Territories and Nunavut expenditures in 1999 with the total Northwest Territories expenditure in 1998.
Note: Numbers may not add to totals due to rounding.

TABLE 9a. EXPLORATION ACTIVITY[1] BY PROVINCE AND TERRITORY, BY TYPE OF WORK, 1998

Province/Territory	Drilling (Surface and Underground)				Geochemical	Geology	Geophysical		Rock Work[2]	Other Field Costs	Engineering Studies	Economic Studies	Pre- or Production Feasibility Studies	Mineral Lease and Head Office	Environment	Land Access	Grand Total
	Diamond		Other				Ground	Airborne									
	Metres	Cost	Metres	Cost													
	(000)	($000)	(000)	($000)							($000)						
Newfoundland	73	12 300	...	6	672	5 850	5 909	1 152	626	661	161	40	–	2 793	774	53	30 997
Nova Scotia	19	1 749	1	36	51	798	258	–	444	171	278	7	–	487	337	56	4 675
New Brunswick	45	3 985	–	–	387	1 369	1 738	–	236	140	27	–	–	1 199	42	38	9 161
Quebec	510	37 011	...	12	3 522	20 321	4 753	1 954	5 493	1 700	312	100	561	6 348	498	64	82 649
Ontario	799	57 189	1	123	2 784	17 699	7 693	475	4 317	1 058	536	73	442	6 298	350	184	99 222
Manitoba	121	12 030	–	–	1 895	2 957	3 323	1 011	43	943	–	21	–	3 113	31	60	25 429
Saskatchewan	118	15 524	1	119	1 700	1 892	3 027	595	271	1 284	30	3	4	5 338	1	...	29 768
Alberta	17	4 510	21	895	1 035	2 959	1 274	5 510	2	453	192	–	185	1 349	2 094	78	20 438
British Columbia	125	11 475	...	20	2 031	7 122	1 759	909	5 158	610	379	53	121	4 153	1 234	16	35 039
Yukon	17	3 046	6	879	3 164	5 776	852	102	940	331	100	–	30	1 323	145	265	16 953
Northwest Territories	180	33 141	27	4 493	19 705	17 081	4 449	8 562	1 676	1 309	922	9	356	10 184	5 796	791	108 475
Total	2 024	191 960	58	6 583	36 945	83 825	35 036	20 270	19 209	8 640	2 947	306	1 698	42 587	11 294	1 605	462 605
Percentage of grand total	n.a.	41.5	n.a.	1.4	8.0	18.1	7.6	4.4	4.2	1.9	0.6	0.1	0.4	9.2	2.4	0.3	100.0

Source: Natural Resources Canada, from a federal-provincial-territorial survey of mining and exploration companies.
– Nil; . . . Amount too small to be expressed; n.a. Not applicable.
1 Includes on-mine-site plus off-mine-site activities. 2 Includes stripping, trenching, shaft work, drifts, cross-cuts, raises, declines, rock sampling and de-watering costs.
Note: Numbers may not add to totals due to rounding.

TABLE 9b. DEPOSIT APPRAISAL ACTIVITY,[1] BY PROVINCE AND TERRITORY, BY TYPE OF WORK, 1998

Province/Territory	Drilling (Surface and Underground)				Geochemical	Geology	Geophysical		Rock Work[2]	Other Field Costs	Engineering Studies	Economic Studies	Pre- or Production Feasibility Studies	Mineral Lease and Head Office	Environment	Land Access	Grand Total
	Diamond		Other				Ground	Airborne									
	Metres	Cost	Metres	Cost													
	(000)	($000)	(000)	($000)							($000)						
Newfoundland	30	9 094	–	–	18	116	207	–	11	694	233	18	461	686	5 127	193	16 858
Nova Scotia	1	98	–	–	–	64	–	–	374	35	137	35	220	270	496	69	1 797
New Brunswick	18	924	–	–	–	–	–	–	12	–	–	–	–	10	5	–	951
Quebec	154	5 304	1	67	–	136	55	–	35 520	414	1 081	64	615	931	230	6	44 423
Ontario	70	4 911	–	–	–	2 237	150	150	5 095	3	590	–	1 140	1 092	180	50	15 599
Manitoba	37	3 218	–	–	117	13	94	–	611	13	119	–	–	97	140	1	4 423
Saskatchewan	15	1 201	6	136	–	101	32	–	16 325	7 653	1 706	–	335	2 620	1 722	472	32 303
Alberta	...	10	69	1 617	5	43	–	–	886	144	759	403	80	885	2 196	...	7 028
British Columbia	28	2 764	1	45	212	826	309	–	5 167	267	3 159	141	2 008	1 435	2 696	449	19 476
Yukon	3	372	5	610	–	–	–	–	7	66	161	–	169	53	1 662	22	3 122
Northwest Territories	75	10 888	–	–	161	297	12	150	65	5	26 113	–	27	2 656	5 920	853	47 146
Total	433	38 784	82	2 474	514	3 832	859	300	64 072	9 294	34 059	661	5 053	10 736	20 373	2 115	193 126
Percentage of grand total	n.a.	20.1	n.a.	1.3	0.3	2.0	0.4	0.2	33.2	4.8	17.6	0.3	2.6	5.6	10.5	1.1	100.0

Source: Natural Resources Canada, from a federal-provincial-territorial survey of mining and exploration companies.
– Nil; . . . Amount too small to be expressed; n.a. Not applicable.
1 Includes on-mine-site plus off-mine-site activities. 2 Includes stripping, trenching, shaft work, drifts, cross-cuts, raises, declines, rock sampling and de-watering costs.
Note: Numbers may not add to totals due to rounding.

TABLE 9c: EXPLORATION PLUS DEPOSIT APPRAISAL ACTIVITIES,[1] BY PROVINCE AND TERRITORY, BY TYPE OF WORK, 1996

Province/Territory	Drilling (Surface and Underground)				Geochemical	Geology	Geophysical		Rock Work[2]	Other Field Costs	Mineral Lease and Head Office	Total	Engineering Studies	Economic Studies	Pre- or Production Feasibility Studies	Environment	Land Access	Grand Total
	Diamond		Other				Ground	Airborne										
	Metres	Cost	Metres	Cost														
	(000)	($000)	(000)	($000)							($000)							
Newfoundland	103	21 394	. . .	6	690	5 965	6 116	1 152	637	1 386	3 480	40 796	393	58	461	5 901	246	47 855
Nova Scotia	21	1 847	1	36	51	862	258	–	818	205	758	4 835	416	42	220	833	125	6 471
New Brunswick	63	4 908	–	–	387	1 369	1 739	–	248	140	1 209	10 000	27	–	–	47	38	10 111
Quebec	664	42 315	1	79	3 522	20 457	4 808	1 984	41 013	2 114	7 279	123 542	1 393	164	1 175	728	70	127 072
Ontario	668	62 101	1	123	2 784	19 936	7 843	625	9 413	1 061	7 391	111 276	1 126	73	1 582	529	234	114 820
Manitoba	158	15 248	–	–	2 012	2 870	3 416	1 011	854	956	3 211	29 479	119	21	–	172	61	29 852
Saskatchewan	134	16 725	7	256	1 700	1 983	3 099	595	16 596	8 917	7 960	57 787	1 736	3	339	1 723	472	62 071
Alberta	18	4 520	91	2 511	1 040	3 002	1 274	5 510	888	597	2 235	21 578	661	403	265	4 281	78	27 466
British Columbia	153	14 239	1	65	2 243	7 946	2 068	909	10 328	877	5 567	44 262	3 538	194	2 127	3 930	466	54 515
Yukon	20	3 418	11	1 469	3 164	5 776	852	102	947	397	1 376	17 521	281	–	199	1 807	287	20 075
Northwest Territories	255	44 029	27	4 493	19 867	17 378	4 461	8 712	1 741	1 313	12 941	114 634	27 036	9	383	11 715	1 644	155 622
Total	2 456	230 744	140	9 057	37 469	87 657	35 894	20 570	83 281	17 934	53 323	575 920	36 906	966	6 751	31 667	3 720	655 931
Percentage of total	n.a.	40.1	n.a.	1.6	6.5	15.2	6.2	3.6	14.5	3.1	9.3	100.0	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Percentage of grand total	n.a.	35.2	n.a.	1.4	5.7	13.4	5.5	3.1	12.7	2.7	8.1	87.8	5.6	0.1	1.0	4.8	0.6	100.0

Source: Natural Resources Canada, from a federal-provincial-territorial survey of mining and exploration companies.
– Nil; . . . Amount too small to be expressed; n.a. Not applicable.
1 Includes on-mine-site plus off-mine-site activities. 2 Includes stripping, trenching, shaft work, drifts, cross-cuts, raises, declines, rock sampling and de-watering costs.
Note: Numbers may not add to totals due to rounding.

TABLE 9d: MINE COMPLEX DEVELOPMENT ACTIVITY,[1] BY PROVINCE AND TERRITORY, BY TYPE OF WORK, 1996

Province/Territory	Drilling (Surface and Underground)				Geochemical	Geology	Geophysical		Rock Work[1]	Stripping	Other Field Costs	Engineering Studies	Economic Studies	Pre- or Production Feasibility Studies	Mineral Lease and Head Office	Environment	Land Access	Grand Total
	Diamond		Other				Ground	Airborne										
	Metres	Cost	Metres	Cost														
	(000)	($000)	(000)	($000)								($000)						
Newfoundland	4	312	138	1 980	1	78	–	–	129	6 960	–	17	–	–	24	–	35	9 544
Nova Scotia	–	–	5	475	–	22	168	–	258	1 657	16	24	10	20	178	247	17	3 031
New Brunswick	121	4 788	237	8 404	30	30	40	–	19 958	6 808	–	96	–	–	83	93	200	40 510
Quebec	231	14 770	77	4 578	149	2 247	8	. . .	141 441	68 866	15 124	3 355	–	7 050	38 466	7 573	96	321 774
Ontario	337	17 305	194	6 940	63	3 947	120	–	232 958	–	1 000	1 421	–	25	2 557	856	443	287 545
Manitoba	157	7 582	–	–	392	1 033	–	–	54 916	–	166	629	–	148	1 047	8	–	66 151
Saskatchewan	20	2 146	79	6 787	–	40	2 462	–	39 402	414	7 914	4 438	–	–	12 410	262	–	76 218
Alberta	3	310	71	3 541	–	216	16	–	840	3 203	160	470	22	75	2 239	818	143	12 115
British Columbia	46	2 968	634	12 149	1 112	1 386	–	–	12 961	28 731	3 918	2	420	100	3 526	1	3 584	70 466
Yukon	–	–	–	–	–	–	–	–	–	2 000	–	–	–	–	50	–	–	2 050
Northwest Territories	19	651	–	–	–	704	–	–	5 912	56 932	1 666	500	–	–	5 903	103	264	76 656
Total	933	50 452	1 433	44 872	1 747	9 700	2 686	. . .	536 676	195 663	30 008	11 152	452	7 427	66 474	9 958	4 783	986 061
Percentage of grand total	n.a.	5.2	n.a.	4.6	0.2	1.0	0.3	0.0	54.7	20.3	3.1	1.2	0.0	0.8	7.1	1.0	0.5	100.0

Source: Natural Resources Canada, from a federal-provincial-territorial survey of mining and exploration companies.
– Nil; . . . Amount too small to be expressed; n.a. Not applicable.
1 Includes shaft work, drifts, cross-cuts, raises, declines, rock sampling and de-watering costs.
Note: Numbers may not add to totals due to rounding.

TABLE 10. SUMMARY OF DRILLING ACTIVITY IN CANADA, 1998

Drilling Activity	Exploration				Deposit Appraisal				Exploration Plus Deposit Appraisal
	Off-Mine-Site		On-Mine-Site		Off-Mine-Site		On-Mine-Site		On- Plus Off-Mine-Site
	(metres)	(% of subtotal)	(metres)	(% of subtotal)	(metres)	(% of subtotal)	(metres)	(% of subtotal)	(metres)
Diamond drilling									
Surface	1 371 688	96.4	190 463	26.7	163 668	84.9	30 143	12.5	1 725 962
Underground	50 653	3.6	441 602	73.3	29 120	15.1	210 495	87.5	731 870
Subtotal	1 422 341	100.0	632 065	100.0	192 788	100.0	240 638	100.0	2 457 832
Percentage of off- plus on-mine-site diamond drilling	70.3		29.7		44.5		55.5		
Other drilling									
Surface	47 024	100.0	10 939	100.0	61 128	100.0	20 822	100.0	139 912
Underground	–	0.0	–	0.0	–	0.0	–	0.0	–
Subtotal	47 024	100.0	10 939	100.0	61 128	100.0	20 822	100.0	139 912
Percentage of other drilling for off- plus on-mine-site	81.1		18.9		74.6		25.4		
Total	1 469 365		643 004		253 916		261 460		2 597 744

Source: Natural Resources Canada, from a federal-provincial-territorial survey of mining and exploration companies.
– Nil.
Note: Numbers may not add to totals due to rounding.

TABLE 11a. EXPLORATION PLUS DEPOSIT APPRAISAL, SURFACE DRILLING,[1] BY PROVINCE AND TERRITORY, BY MINERAL COMMODITY SOUGHT, 1998

Province/Territory	Metals					Nonmetals	Diamonds	Coal	Total
	Base	Precious	Iron	Uranium	Other				
	(000 metres)								
Newfoundland	58	13	1	–	25	5	–	–	101
Nova Scotia	3	1	...	–	...	18	–	–	22
New Brunswick	41	3	–	–	...	2	–	–	46
Quebec	180	231	–	2	5	4	4	–	427
Ontario	147	313	–	–	6	2	4	–	472
Manitoba	91	19	–	–	6	–	–	–	116
Saskatchewan	13	8	–	98	–	...	2	6	126
Alberta	...	1	–	–	–	...	17	90	108
British Columbia	43	88	–	–	3	2	–	–	136
Yukon	8	24	–	–	–	–	–	–	31
Northwest Territories	34	138	–	10	16	–	82	–	281
Total	618	839	1	110	60	33	108	96	1 866

Source: Natural Resources Canada, from a federal-provincial-territorial survey of mining and exploration companies.
– Nil; ... Amount too small to be expressed.
[1] Includes on-mine-site plus off-mine-site activities. Drilling includes diamond and other types of drilling.
Note: Numbers may not add to totals due to rounding.

TABLE 11b. EXPLORATION PLUS DEPOSIT APPRAISAL, UNDERGROUND DRILLING,[1] BY PROVINCE AND TERRITORY, BY MINERAL COMMODITY SOUGHT, 1998

Province/Territory	Metals					Nonmetals	Diamonds	Coal	Total
	Base	Precious	Iron	Uranium	Other				
					(000 metres)				
Newfoundland	–	3	–	–	–	–	–	–	3
Nova Scotia	–	–	–	–	–	–	–	–	–
New Brunswick	11	6	–	–	–	–	–	–	17
Quebec	38	201	–	–	–	–	–	–	239
Ontario	130	228	–	–	40	–	–	–	398
Manitoba	42	–	–	–	–	–	–	–	42
Saskatchewan	13	–	–	1	–	–	–	–	14
Alberta	–	–	–	–	–	–	–	–	–
British Columbia	7	11	–	–	–	–	–	–	18
Yukon	–	–	–	–	–	–	–	–	–
Northwest Territories	1	–	–	–	–	–	–	–	1
Total	242	449	–	1	40	–	–	–	732

Source: Natural Resources Canada, from a federal-provincial-territorial survey of mining and exploration companies.
– Nil.
[1] Includes on-mine-site plus off-mine-site activities. Drilling includes diamond and other types of drilling.
Note: Numbers may not add to totals due to rounding.

TABLE 12. EXPLORATION PLUS DEPOSIT APPRAISAL EXPENDITURES,[1] BY MINERAL COMMODITY SOUGHT, 1998

Mineral Commodity	1998 Field Work and Overhead Expenditures	1998 as % of 1997 Expenditures	Total Expenditures[2]			Percentage of Canadian Total[2]
			On-Mine-Site	Off-Mine-Site	On-Mine-Site Plus Off-Mine-Site	
	($ millions)	(%)		($ millions)		(%)
Base metals[3]	179.4	67.8	36.6	155.5	192.1	29.3
Precious metals[4]	228.5	61.6	74.4	168.5	243.0	37.0
Iron ore	0.1	7.7	0.1	0.1	0.1	...
Uranium	48.9	142.1	–	51.5	51.5	7.9
Other metals	19.6	68.3	2.8	20.8	23.6	3.6
Nonmetals	9.9	92.7	1.7	11.2	12.9	2.0
Diamonds	82.7	89.6	9.9	109.3	119.1	18.2
Coal	6.4	39.4	3.9	9.3	13.2	2.0
Unspecified mineral commodities	0.4	215.8	–	0.4	0.4	0.1
Total	575.9	70.2	129.4	526.5	655.9	100.0

Source: Natural Resources Canada, from a federal-provincial-territorial survey of mining and exploration companies.
– Nil; . . . Amount too small to be expressed.
[1] Includes on-mine-site plus off-mine-site activities. [2] Includes field work, overhead, engineering, economic and pre- or production feasibility studies, environment and land access expenditures. [3] Includes copper, nickel, lead and zinc. [4] Includes silver, gold and platinum group metals.
Note: Numbers may not add to totals due to rounding.

TABLE 13a. EXPLORATION EXPENDITURES,[1] BY PROVINCE AND TERRITORY, BY MINERAL COMMODITY SOUGHT, 1998

Province/Territory	Metals					Nonmetals	Diamonds	Coal	Unspecified Mineral Commodity	Total
	Base	Precious	Iron	Uranium	Other					
						($000)				
Newfoundland	17 518	4 855	81	–	6 562	2 065	116	–	–	30 997
Nova Scotia	296	147	35	–	114	3 794	–	287	–	4 675
New Brunswick	7 739	1 389	–	–	12	16	–	–	4	9 161
Quebec	39 234	38 120	19	541	1 156	1 108	2 472	–	–	82 649
Ontario	29 930	60 422	–	–	4 111	524	3 863	–	373	99 222
Manitoba	20 245	3 545	–	–	736	230	673	–	–	25 429
Saskatchewan	2 686	2 362	–	23 637	77	65	781	155	6	29 768
Alberta	30	507	–	26	–	–	16 079	3 796	–	20 438
British Columbia	14 011	19 075	3	–	543	1 254	–	153	–	35 039
Yukon	4 580	11 943	–	–	210	–	–	220	–	16 953
Northwest Territories	12 333	29 335	–	3 778	883	–	62 131	–	15	108 475
Total	148 605	171 498	138	27 981	14 403	9 055	86 114	4 611	399	462 805

Source: Natural Resources Canada, from a federal-provincial-territorial survey of mining and exploration companies.
– Nil.
[1] Includes on-mine-site plus off-mine-site activities. Includes field work, overhead, engineering, economic and pre-feasibility studies, environment and land access expenditures.
Note: Numbers may not add to totals due to rounding.

TABLE 13b. DEPOSIT APPRAISAL EXPENDITURES,[1] BY PROVINCE AND TERRITORY, BY MINERAL COMMODITY SOUGHT, 1998

Province/Territory	Metals					Nonmetals	Diamonds	Coal	Unspecified Mineral Commodity	Total
	Base	Precious	Iron	Uranium	Other					
						($000)				
Newfoundland	10 695	17	–	–	5 292	854	–	–	–	16 858
Nova Scotia	219	606	–	–	52	455	–	465	–	1 797
New Brunswick	489	326	–	–	–	136	–	–	–	951
Quebec	7 230	35 389	–	–	810	994	–	–	–	44 423
Ontario	4 189	10 634	–	–	760	15	–	–	–	15 599
Manitoba	4 067	121	–	–	58	177	–	–	–	4 423
Saskatchewan	8 310	–	–	23 463	–	338	–	192	–	32 303
Alberta	–	–	–	–	–	44	–	6 984	–	7 028
British Columbia	5 730	11 809	–	–	159	828	40	910	–	19 476
Yukon	1 232	1 890	–	–	–	–	–	–	–	3 122
Northwest Territories	1 345	10 681	–	51	2 082	–	32 987	–	–	47 146
Total	43 508	71 472	–	23 514	9 213	3 841	33 027	8 551	–	193 126

Source: Natural Resources Canada, from a federal-provincial-territorial survey of mining and exploration companies.
– Nil.
[1] Includes on-mine-site plus off-mine-site activities. Includes field work, overhead, engineering, economic and production feasibility studies, environment and land access expenditures.
Note: Numbers may not add to totals due to rounding.

TABLE 13c. EXPLORATION PLUS DEPOSIT APPRAISAL EXPENDITURES,[1] BY PROVINCE AND TERRITORY, BY MINERAL COMMODITY SOUGHT, 1998

Province/Territory	Metals					Nonmetals	Diamonds	Coal	Unspecified Mineral Commodity	Total
	Base	Precious	Iron	Uranium	Other					
						($000)				
Newfoundland	28 213	4 872	81	–	11 854	2 919	116	–	–	47 855
Nova Scotia	518	753	35	–	166	4 249	–	752	–	6 471
New Brunswick	8 228	1 715	–	–	12	151	–	–	4	10 111
Quebec	46 464	73 509	19	541	1 965	2 103	2 472	–	–	127 072
Ontario	34 119	71 056	–	–	4 871	539	3 863	–	373	114 820
Manitoba	24 313	3 666	–	–	794	406	673	–	–	29 852
Saskatchewan	10 996	2 362	–	47 100	77	403	781	347	6	62 071
Alberta	30	507	–	26	–	44	16 079	10 780	–	27 465
British Columbia	19 742	30 883	3	–	702	2 082	40	1 063	–	54 515
Yukon	5 813	13 833	–	–	210	–	–	220	–	20 075
Northwest Territories	13 678	40 015	–	3 829	2 966	–	95 118	–	15	155 622
Total	192 113	242 970	138	51 495	23 616	12 896	119 141	13 162	399	655 931

Source: Natural Resources Canada, from a federal-provincial-territorial survey of mining and exploration companies.
– Nil.
[1] Includes on-mine-site plus off-mine-site activities. Includes field work, overhead, engineering, economic and pre- or production feasibility studies, environment and land access expenditures.
Note: Numbers may not add to totals due to rounding.

TABLE 13d. EXPLORATION PLUS DEPOSIT APPRAISAL, FIELD WORK PLUS OVERHEAD EXPENDITURES,[1] BY PROVINCE AND TERRITORY, BY MINERAL COMMODITY SOUGHT, 1998

Province/Territory	Metals					Nonmetals	Diamonds	Coal	Unspecified Mineral Commodity	Total
	Base	Precious	Iron	Uranium	Other					
						($000)				
Newfoundland	24 541	3 871	81	–	10 081	2 114	108	–	–	40 796
Nova Scotia	299	654	30	–	108	3 590	–	154	–	4 835
New Brunswick	8 138	1 698	–	–	12	146	–	–	4	10 000
Quebec	46 049	72 050	19	531	1 053	1 388	2 472	–	–	123 542
Ontario	32 953	69 240	–	–	4 506	319	3 825	–	373	111 276
Manitoba	24 197	3 482	–	–	742	385	673	–	–	29 479
Saskatchewan	9 613	2 349	–	44 589	77	68	781	315	6	57 797
Alberta	30	505	–	28	–	15	15 863	5 139	–	21 578
British Columbia	15 777	25 229	3	–	674	1 917	40	622	–	44 262
Yukon	4 623	12 468	–	–	210	–	–	220	–	17 521
Northwest Territories	13 143	38 935	–	3 801	2 038	–	58 901	–	15	114 834
Total	179 382	228 482	134	48 947	19 580	9 923	82 663	6 450	398	575 920

Source: Natural Resources Canada, from a federal-provincial-territorial survey of mining and exploration companies.
– Nil.
1 Includes on-mine-site plus off-mine-site activities.
Note: Numbers may not add to totals due to rounding.

TABLE 13e. MINE DEVELOPMENT[1] EXPENDITURES, BY PROVINCE AND TERRITORY, BY MINERAL COMMODITY SOUGHT, 1998

Province/Territory	Metals					Nonmetals	Diamonds	Coal	Unspecified Mineral Commodity	Total
	Base	Precious	Iron	Uranium	Other					
						($000)				
Newfoundland	–	–	8 175	–	204	1 165	–	–	–	9 544
Nova Scotia	–	–	–	–	–	2 426	–	606	–	3 031
New Brunswick	23 888	14 063	–	–	–	2 559	–	–	–	40 510
Quebec	85 773	89 194	94 205	–	19 525	53 078	–	–	–	321 774
Ontario	109 610	170 832	–	–	4 887	2 216	–	–	–	287 545
Manitoba	51 339	14 496	–	–	211	105	–	–	–	66 151
Saskatchewan	–	4 447	–	63 198	–	8 320	–	253	–	76 218
Alberta	–	–	–	–	–	252	–	11 862	–	12 115
British Columbia	6 299	4 898	–	–	5 219	620	–	53 059	–	70 465
Yukon	1 350	700	–	–	–	–	–	–	–	2 050
Northwest Territories	2 710	7 418	–	–	–	–	68 532	–	–	78 658
Total	280 939	285 848	102 380	63 198	30 048	70 741	68 532	66 381	–	988 081

Source: Natural Resources Canada, from a federal-provincial-territorial survey of mining and exploration companies.
– Nil.
1 Includes field work, overhead, engineering, economic and pre- or production feasibility studies, environment and land access expenditures.
Note: Numbers may not add to totals due to rounding.

TABLE 14a. EXPLORATION EXPENDITURES,[1] BY TYPE OF COMPANY AND MINERAL COMMODITY, 1998

Type of Company	Metals					Nonmetals	Diamonds	Coal	Unspecified Mineral Commodity	Total
	Base	Precious	Iron	Uranium	Other					
						($000)				
1. Companies with a producing mine in Canada	79 660	82 320	81	22 003	4 139	1 606	13 251	4 381	21	207 551
2. Affiliates of group 1	14 517	4 527	–	–	2 792	–	14 880	–	153	36 869
3. Oil companies	603	434	–	–	–	–	–	5	–	1 042
4. Foreign companies (excluding group 3)	5 582	13 039	–	191	84	–	30 268	–	–	49 144
5. Junior companies and prospectors	39 962	57 330	38	5 548	7 051	6 880	27 715	226	220	144 970
6. Other companies	8 281	13 849	19	149	358	969	–	–	4	23 229
Total all classes	148 605	171 498	138	27 981	14 453	9 055	86 114	4 611	398	462 803

Source: Natural Resources Canada, from a federal-provincial-territorial survey of mining and exploration companies.
– Nil.
1 Includes on-mine-site plus off-mine-site activities. Includes field work, overhead, engineering, economic and pre-feasibility studies, environment and land access expenditures.
Note: Numbers may not add to totals due to rounding.

TABLE 14b. DEPOSIT APPRAISAL EXPENDITURES,[1] BY TYPE OF COMPANY AND MINERAL COMMODITY, 1998

Type of Company	Metals					Nonmetals	Diamonds	Coal	Unspecified Mineral Commodity	Total
	Base	Precious	Iron	Uranium	Other					
	($000)									
1. Companies with a producing mine in Canada	22 426	47 166	–	51	828	1 842	–	7 640	–	79 954
2. Affiliates of group 1	13 845	1 949	–	23 463	5 282	–	32 416	–	–	76 955
3. Oil companies	–	–	–	–	–	–	–	260	–	260
4. Foreign companies (excluding group 3)	1 000	1 287	–	–	–	–	–	–	–	2 287
5. Junior companies and prospectors	4 281	15 143	–	–	3 102	1 786	611	650	–	25 573
6. Other companies	1 956	5 927	–	–	–	213	–	–	–	8 096
Total all classes	43 508	71 472	–	23 514	9 213	3 841	33 027	8 551	–	193 126

Source: Natural Resources Canada, from a federal-provincial-territorial survey of mining and exploration companies.
– Nil.
[1] Includes on-mine-site plus off-mine-site activities. Includes field work, overhead, engineering, economic and pre- or production feasibility studies, environment and land access expenditures.
Note: Numbers may not add to totals due to rounding.

TABLE 14c. EXPLORATION PLUS DEPOSIT APPRAISAL EXPENDITURES,[1] BY TYPE OF COMPANY AND MINERAL COMMODITY, 1998

Type of Company	Metals					Nonmetals	Diamonds	Coal	Unspecified Mineral Commodity	Total
	Base	Precious	Iron	Uranium	Other					
	($000)									
1. Companies with a producing mine in Canada	102 086	129 486	81	22 144	4 967	3 448	13 251	12 022	21	287 506
2. Affiliates of group 1	28 362	8 476	–	23 463	8 075	–	47 296	–	153	113 824
3. Oil companies	603	434	–	–	–	–	–	265	–	1 302
4. Foreign companies (excluding group 3)	6 582	14 326	–	191	64	–	30 268	–	–	51 431
5. Junior companies and prospectors	44 243	72 473	38	5 548	10 153	8 667	28 326	876	220	170 544
6. Other companies	10 237	19 776	19	149	358	782	–	–	4	31 325
Total all classes	192 113	242 970	138	51 495	23 616	12 896	119 141	13 162	399	655 931

Source: Natural Resources Canada, from a federal-provincial-territorial survey of mining and exploration companies.
– Nil.
[1] Includes on-mine-site plus off-mine-site activities. Includes field work, overhead, engineering, economic and pre- or production feasibility studies, environment and land access expenditures.
Note: Numbers may not add to totals due to rounding.

TABLE 14d. EXPLORATION PLUS DEPOSIT APPRAISAL, FIELD WORK PLUS OVERHEAD EXPENDITURES[1] BY TYPE OF COMPANY AND MINERAL COMMODITY, 1998

Type of Company	Metals					Nonmetals	Diamonds	Coal	Unspecified Mineral Commodity	Total
	Base	Precious	Iron	Uranium	Other					
	($000)									
1. Companies with a producing mine in Canada	97 610	123 981	81	22 116	4 115	2 055	8 523	5 749	21	264 253
2. Affiliates of group 1	24 311	6 232	–	20 953	6 317	–	17 605	–	153	75 572
3. Oil companies	603	434	–	–	–	–	–	195	–	1 232
4. Foreign companies (excluding group 3)	6 072	12 323	–	191	64	–	30 038	–	–	48 688
5. Junior companies and prospectors	40 656	66 238	34	5 547	8 891	7 321	26 496	506	220	155 909
6. Other companies	10 111	19 273	19	139	174	546	–	–	4	30 266
Total all classes	179 362	228 482	134	48 947	19 560	9 923	82 663	6 450	399	575 920

Source: Natural Resources Canada, from a federal-provincial-territorial survey of mining and exploration companies.
– Nil.
[1] Includes on-mine-site plus off-mine-site activities.
Note: Numbers may not add to totals due to rounding.

TABLE 15a. EXPLORATION EXPENDITURES[1] BY PROVINCE AND TERRITORY, BY TYPE OF COMPANY, 1998

Province/Territory	(1) Companies With a Producing Mine in Canada	(2) Affiliates of (1)	(3) Oil Companies	(4) Foreign Companies Excluding (3)	(5) Junior Companies and Prospectors	(6) Other Companies	Total
				($000)			
Newfoundland	4 485	9 603	–	316	16 495	99	30 997
Nova Scotia	735	–	–	131	3 809	–	4 675
New Brunswick	6 745	–	–	52	2 313	51	9 161
Quebec	43 670	326	–	2 923	26 652	9 078	82 649
Ontario	58 039	2 329	58	3 323	27 478	7 995	99 222
Manitoba	14 865	3 809	–	504	4 998	1 253	25 429
Saskatchewan	21 370	1 583	24	275	6 505	11	29 768
Alberta	3 812	960	5	10 182	5 480	–	20 438
British Columbia	13 221	3 045	–	475	13 557	4 741	35 039
Yukon	6 309	1 709	–	613	8 322	–	16 953
Northwest Territories	34 301	13 507	955	30 351	29 361	–	108 475
Total	207 551	36 869	1 042	49 144	144 970	23 229	462 805

Source: Natural Resources Canada, from a federal-provincial-territorial survey of mining and exploration companies.
– Nil.
1 Includes on-mine-site plus off-mine-site activities. Includes field work, overhead, engineering, economic and pre-feasibility studies, environment and land access expenditures.
Note: Numbers may not add to totals due to rounding.

TABLE 15b. DEPOSIT APPRAISAL EXPENDITURES,[1] BY PROVINCE AND TERRITORY, BY TYPE OF COMPANY, 1998

Province/Territory	(1) Companies With a Producing Mine in Canada	(2) Affiliates of (1)	(3) Oil Companies	(4) Foreign Companies Excluding (3)	(5) Junior Companies and Prospectors	(6) Other Companies	Total
				($000)			
Newfoundland	772	15 847	–	–	238	–	16 858
Nova Scotia	706	–	–	–	1 091	–	1 797
New Brunswick	951	–	–	–	–	–	951
Quebec	42 932	–	–	–	1 491	–	44 423
Ontario	5 772	3 009	–	1 000	4 118	1 700	15 599
Manitoba	1 801	2 220	–	–	402	–	4 423
Saskatchewan	8 654	23 463	–	–	186	–	32 303
Alberta	7 028	–	–	–	–	–	7 028
British Columbia	4 039	–	260	–	9 141	6 037	19 476
Yukon	2 684	–	–	–	108	330	3 122
Northwest Territories	4 615	32 416	–	1 287	8 798	30	47 146
Total	79 954	76 955	260	2 287	25 573	8 096	193 126

Source: Natural Resources Canada, from a federal-provincial-territorial survey of mining and exploration companies.
– Nil.
1 Includes on-mine-site plus off-mine-site activities. Includes field work, overhead, engineering, economic and pre- or production feasibility studies, environment and land access expenditures.
Note: Numbers may not add to totals due to rounding.

TABLE 15c. EXPLORATION PLUS DEPOSIT APPRAISAL EXPENDITURES,[1] BY PROVINCE AND TERRITORY, BY TYPE OF COMPANY, 1998

Province/Territory	(1) Companies With a Producing Mine in Canada	(2) Affiliates of (1)	(3) Oil Companies	(4) Foreign Companies Excluding (3)	(5) Junior Companies and Prospectors	(6) Other Companies	Total
				($000)			
Newfoundland	5 257	25 450	–	316	16 733	99	47 855
Nova Scotia	1 441	–	–	131	4 900	–	6 471
New Brunswick	7 696	–	–	52	2 313	51	10 111
Quebec	86 602	326	–	2 923	28 144	9 078	127 072
Ontario	63 811	5 338	58	4 323	31 596	9 695	114 820
Manitoba	16 666	6 029	–	504	5 400	1 253	29 852
Saskatchewan	30 025	25 046	24	275	6 691	11	62 071
Alberta	10 840	960	5	10 182	5 480	–	27 465
British Columbia	17 259	3 045	260	475	22 698	10 778	54 515
Yukon	8 993	1 709	–	613	8 431	330	20 075
Northwest Territories	38 916	45 923	955	31 638	38 160	30	155 622
Total	287 506	113 824	1 302	51 431	170 544	31 325	655 931

Source: Natural Resources Canada, from a federal-provincial-territorial survey of mining and exploration companies.
– Nil.
[1] Includes on-mine-site plus off-mine-site activities. Includes field work, overhead, engineering, economic and pre- or production feasibility studies, environment and land access expenditures.
Note: Numbers may not add to totals due to rounding.

TABLE 15d. EXPLORATION PLUS DEPOSIT APPRAISAL, FIELD WORK PLUS OVERHEAD EXPENDITURES,[1] BY PROVINCE AND TERRITORY, BY TYPE OF COMPANY, 1998

Province/Territory	(1) Companies With a Producing Mine in Canada	(2) Affiliates of (1)	(3) Oil Companies	(4) Foreign Companies Excluding (3)	(5) Junior Companies and Prospectors	(6) Other Companies	Total
				($000)			
Newfoundland	3 832	20 178	–	316	16 370	99	40 796
Nova Scotia	348	–	–	131	4 356	–	4 835
New Brunswick	7 592	–	–	52	2 309	47	10 000
Quebec	85 168	326	–	2 923	26 517	8 608	123 542
Ontario	62 766	4 577	58	3 823	30 421	9 631	111 276
Manitoba	16 578	6 024	–	504	5 119	1 253	29 479
Saskatchewan	28 460	22 535	24	275	6 492	11	57 797
Alberta	5 169	960	5	10 012	5 432	–	21 578
British Columbia	14 929	3 035	190	475	15 122	10 511	44 262
Yukon	6 966	1 705	–	613	8 162	74	17 521
Northwest Territories	32 444	16 232	955	29 565	35 609	30	114 834
Total	264 253	75 572	1 232	48 688	155 909	30 266	575 920

Source: Natural Resources Canada, from a federal-provincial-territorial survey of mining and exploration companies.
– Nil.
[1] Includes on-mine-site plus off-mine-site activities.
Note: Numbers may not add to totals due to rounding.

Canadian Mineral Exploration and Discovery Analysis

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Canada's Standing as an Exploration Target

In 1998, exploration and deposit appraisal expenditures for non-petroleum minerals in Canada totaled $656 million. Canada remained one of the world's top targets (second after Australia) in terms of mineral exploration expenditures that year. The "preliminary" exploration and deposit appraisal total for 1999 (gathered early in 1999) is $501 million. The Metals Economics Group's (MEG) survey (data gathered later in 1999) indicates that the United States continued to hold third position in 1999. The relative rankings of these three top countries have remained unchanged since 1992 (Figure 1). The United States has been consistently in third place since 1980.

However, the MEG exploration rankings do not adequately account for exploration expenditures in countries such as China and the various countries that have resulted from the breakup of the former Soviet Union. This is because MEG surveys only exploration expenditures by the "Western" companies exploring these countries, so their survey results are indicative of only part of the exploration there. The value of Chinese non-petroleum mineral output is at least six times that of Canada, at least five times that of Australia, and more than 50% higher than that of the United States. For this reason, it may well be that the magnitude of the Chinese mineral exploration effort actually exceeds that in Australia, Canada and the United States.

The MEG survey has a cutoff exploration budget of US$2.9 million; therefore, the survey has consistently and substantially underestimated the real levels of annual exploration spending in Canada and Australia because both countries each have several hundred active junior exploration companies with individual exploration expenditures that are below that US$2.9 million cutoff. Aggregate exploration expenditures directed at Canada and Australia by

Figure 1
Top Three Country Destinations of Mineral Exploration Capital from Worldwide Sources, 1974-99

	Rank		
Year	First	Second	Third
1999	Australia	**Canada**	United States
1998	Australia	**Canada**	United States
1997	Australia	**Canada**	United States
1996	Australia	**Canada**	United States
1995	Australia	**Canada**	United States
1994	Australia	**Canada**	United States
1993	Australia	**Canada**	United States
1992	Australia	**Canada**	United States
1991	**Canada**	Australia	United States
1990	**Canada**	Australia	United States
1989	**Canada**	Australia	United States
1988	**Canada**	Australia	United States
1987	**Canada**	Australia	United States
1986	**Canada**	Australia	United States
1985	**Canada**	Australia	United States
1984	**Canada**	Australia	United States
1983	**Canada**	Australia	United States
1982	**Canada**	Australia	United States
1981	**Canada**	Australia	United States
1980	Australia	**Canada**	United States
1979	Australia	United States	**Canada**
1978	Australia	United States	**Canada**
1977	United States	**Canada**	Australia
1976	**Canada**	United States	Australia
1975	United States	**Canada**	Australia
1974	**Canada**	United States	Australia

Source: Natural Resources Canada, based on official Canadian and Australian statistics and the best available data for the United States.
Notes: Australian expenditures were 6.5% higher than those for Canada in 1983 and 3.3% higher in 1991; however, correcting the reported Australian totals for substantial mine development expenditures, which are not included in Canadian statistics, ranks Canada first in 1983 and 1991. Complete data are not available for the former Soviet Union and China.

these companies have been substantial, and most likely considerably in excess of the expenditures of junior companies in other individual countries worldwide. For this reason, the MEG survey exploration expenditure totals for Australia and Canada almost undoubtedly understate the exploration expenditures actually being directed at these countries relative to such expenditures in other countries.

Recent Mineral Exploration and Discovery Activity and Results

Continued low market prices for most metals, combined with continued difficulty being experienced by junior companies in raising exploration funds, have resulted in a continued decline in exploration and deposit appraisal spending in Canada to $501 million (preliminary) in 1999, significantly lower than the $656 million spent in 1998. Such expenditures are expected to remain about the same in 2000 as in 1999. Company spending intentions for exploration and deposit appraisal in 2000 (gathered early in 2000) total $502 million.

New orebodies continue to be discovered in various Canadian localities. Falconbridge Limited continues to discover additional nickel-copper-platinum group metals deposits on its property in the Ungava Nickel Belt of Quebec and, based on a surface drill hole intersection of 33.4 m (true thickness approximately 18 m) averaging 2.6% nickel and 0.8% copper, at a depth of 436 m, appears to have made a discovery at Sudbury, Ontario, located 3 km west of Inco Limited's Creighton mine. Also at Sudbury, Inco has discovered a new deposit near its former Totten mine. Exploration of important gold deposits continues in Nunavut near Rankin Inlet, Hope Bay, Baker Lake and George Lake. Hudson Bay Mining and Smelting is developing its deep, recently discovered, Triple 7 orebody at Flin Flon, Manitoba, and, in Saskatchewan, a new high-grade uranium deposit appears to have been discovered on the La Roque claims, near Dawn Lake, where three drill holes intersected 6.95% U over 3.6 m, 25.36% U over 7.0 m and 16.2% U over 2.5 m. In Quebec, Noranda Inc. has recently discovered the high-grade Perseverance zinc-copper deposit near Matagami.

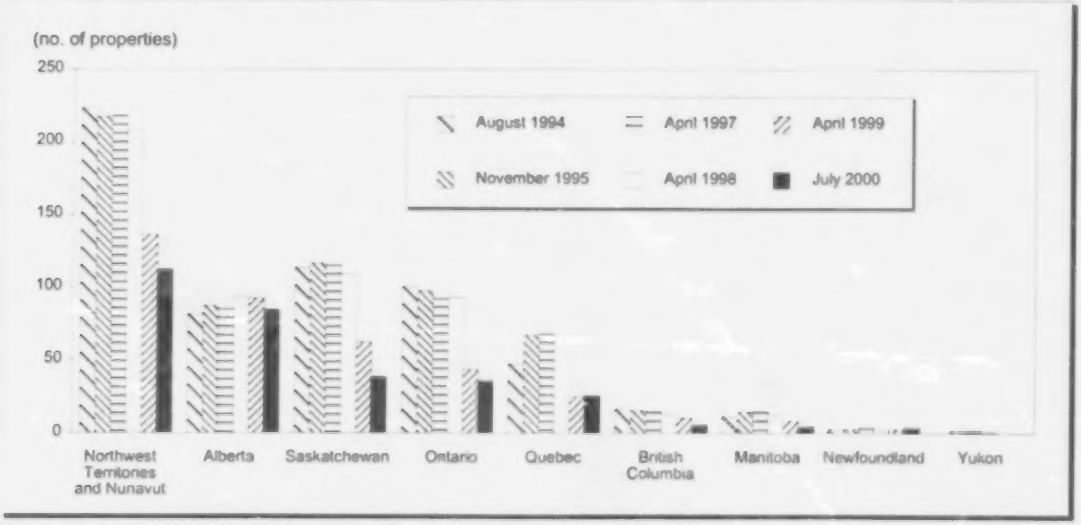
Diamond Exploration Highlights

Introduction

In July 2000, there were some 315 diamond exploration properties in Canada (Figure 2), down from 378 properties in April 1998.

Diamond exploration continues in the Northwest Territories, Nunavut, Saskatchewan, Manitoba,

Figure 2
Exploration for Diamonds in Canada, 1994-2000
Distribution of Properties by Province and Territory



Source: Natural Resources Canada, based on *MIN-MET CANADA* database for 1992-98 and *InfoMine* db for 1999-2000, Robertson Info-Data Inc., Vancouver, British Columbia and used under licence.
Note: The decrease in number of properties between 1998 and 1999 is probably due in part to the implementation of database features that make it possible to exclude inactive properties in 1999.

Ontario, Quebec and Labrador. A 10 000-t bulk sample is being taken by De Beers-owned Monopros Limited on the Victor property, in Ontario, 90 km west of James Bay, and a further bulk sample is being taken at the promising Snap Lake deposit near Camsell Lake in the Northwest Territories. The Diavik project at Lac de Gras has received permission to proceed to production, with the Snap Lake deposit likely to be Canada's third diamond producer.

Continuing exploration of the Snap Lake diamond deposit has indicated that its size is considerably larger than the few million tonnes indicated by exploration in 1998; this deposit has the potential to be one of Canada's single most important diamond deposits.

Ekati Diamond Mine

As of the end of 1999, a total of 121 kimberlite pipes had been discovered on the Ekati property, 86 of them on the Core Zone (a joint venture of BHP Diamonds Inc., 51%; Dia Met Minerals Ltd., 29%; Charles E. Fipke, 10%; and Stewart L. Blusson, 10%) and 35 on the adjacent Buffer Zone claim block (owned by BHP Diamonds Inc., 51%; Archon Minerals Limited, 31.2%; Charles E. Fipke, 10%; and Dia Met Minerals Ltd., 7.8%).

Bulk samples taken in 1999 from the Gazelle, Phoenix and Piranha pipes yielded the following results:

Pipe	Sample Size	Sample Grade	Value	Value
	(tonnes)	(ct/t)	(US$/ct)	(US$/t)
Gazelle	240.7	0.59	15.12	9
Phoenex	106.1	1.41	24.78	35
Piranha	87.4	2.33	29.72	69

The Gazelle pipe is approximately 2 ha in size and Phoenix is approximately 0.6 ha (a satellite pipe to the Point Lake pipe). Piranha is approximately 0.4 ha and lies beneath Lac de Gras on the boundary between the Buffer Zone and the adjacent property held by Diavik Diamond Mines Inc.

The Lynx pipe, discovered in the Buffer Zone in the summer of 1999, yielded a transparent brown octahedral diamond of 1.43 ct in weight, as well as other stones greater than 0.5 mm in size.

BHP is seeking approval to produce from the Beartooth and Pigeon pipes and has stated that the Ekati diamond mine project is expected to have a life of 25 years or beyond, an increase from the previously announced 17 years. The company now plans to increase diamond output from the Ekati operation by 50%.

Diavik Project, N.W.T.

The Diavik project in the Northwest Territories is operated by Diavik Diamond Mines Inc., which owns a 60% joint-venture interest in the property. This company is a wholly owned subsidiary of Rio Tinto plc of London, England. The remaining 40% is held by Aber Resources Ltd. of Vancouver, British Columbia. Aber is providing 40% of the project costs, retains the right to market its 40% share of diamond production, and has negotiated a diamond sales agreement with the jewellery firm Tiffany and Co. Tiffany has purchased a 14.9% interest in Aber for $104 million and has agreed to purchase a minimum of US$50 million of diamonds annually for a 10-year period.

A feasibility study completed in 1999 estimates a capital cost of $1280 million (± 15%) including $163 million for inflation, design allowances and contingencies. The feasibility study projects a full production rate of 1.5 Mt/y that would produce, after ramp up, at full open-pit production, 6.3-7.0 Mct/y. The capital cost estimates include the cost to construct the Diavik diamond mine, including site facilities, the main processing plant, a diamond sorting facility, mine development and dike construction, camp facilities, logistics, and mobilization and management costs, including engineering and construction management. This $1280 million capital cost estimate is substantially higher than previous cost estimates.

The feasibility study includes a mine plan and schedule with initial open-pit mining in 2003 on the A-154 S and A-154 N kimberlite pipes. The A-418 pipe would be mined by open pit beginning in approximately 2010 and the A-21 pipe would be mined in approximately 2013. Underground mining methods would be employed in the lower portions of the A-154 S and A-418 pipes in the later part of the mine plan.

Exploration results to date on the Diavik property indicate a resource of 37 Mt in four kimberlite pipes containing 133 Mct of diamonds for an average resource grade of 3.6 ct/t. Estimated diluted mineable reserves are 26.5 Mt containing 101.5 Mct, for an average reserve grade of 3.96 ct/t and an average value of US$53/ct. The reserves include only measured and indicated resources, above the 420-m level below surface, deemed to be economic by a specific mining method and mine plan. This estimate excludes inferred resources of 29.8 Mct (12.5 Mt at 2.38 ct/t), which are excluded from reserves and have not been included in the feasibility study or mine plans.

The initial capital cost does not include construction of the A-418 and A-21 dikes starting in 2006 or

underground mining capital or exploration. In addition to ordinary sustaining capital for continued operation of the mine, the estimate for the A-418 dike construction cost is approximately $115 million and the estimate for the A-21 dike construction is approximately $148 million. The estimated cost of underground mining development and equipment purchases is $45 million.

Exploration of the Diavik property continued in 1999, but little information has been released concerning 1999 exploration results. Pipe A-180, discovered in 1998, was further tested to assess its potential. Diamond-bearing kimberlite A-841 (Piranha), situated on the boundary between the Diavik and Ekati properties, was also tested, as were several targets identified in 1997.

Snap Lake Project, N.W.T.

Winspear Resources Ltd. continues to work on the Snap Lake diamond-bearing dike near Camsell Lake in the Northwest Territories. The deposit is owned by Winspear and Aber Resources Ltd., although a dispute arose in March 1999 concerning the extent of Aber's minority ownership. During the winter of 1998/99, two bulk samples were taken from surface pits in the shallow-dipping diamond-bearing dike. A 3003.9-t sample from Pit no. 4 yielded 5542.27 ct of diamonds, for a grade of 1.845 ct/t. These diamonds were valued at US$98.42/ct, yielding a value of US$181.58/t. Six stones exceeded 10.8 ct in weight and have been classified by seven independent valuers as "specials." A total of 88 stones in the parcel exceeded 3 ct in weight. The largest diamond recovered weighs 14.3 ct.

The second of these bulk samples (2981.8 t) from Pit no. 3 yielded 5165.81 ct, for a grade of 1.732 ct/t valued at US$111.98/ct, or US$193.95/t. Three stones from Pit no. 3 exceeded 10.8 ct in weight and have been classified by seven independent valuers as "specials." A total of 103 stones in the parcel are classified as "specials." The largest diamond recovered weighs 14.07 ct. Of all the kimberlite bulk samples taken in Canada, the per tonne values for these two bulk samples are surpassed only by the US$296/t that has been obtained from the A-154 pipe on the Diavik property.

In February 2000, Winspear stated that 189 contiguous drill intersections of the Snap Lake deposit indicate that the NW dike is a gently dipping single phase of macrocrystic hypabyssal kimberlite. MRDI Canada, a division of AGRA Simons Ltd., has established a resource of 21.3 Mt of kimberlite. Included in this resource are 16.47 Mt contained in kimberlite that is greater than one metre thick. Of this 16.47 Mt, approximately 8.35 Mt are classified as an indicated resource with an estimated recoverable grade of 1.97 ct/t and an additional 8.12 Mt are classified as an inferred resource with an estimated recoverable grade of 2.07 ct/t. These tonnage and grade figures include estimates for internal dilution. Resource figures assume a strict 1.18-mm cutoff for diamond recovery.

An advanced exploration program began in January 2000. In this program, a decline will be driven out under Snap Lake to about 600 m east of the bulk sample sites on the Northwest peninsula. From this position a drive will be extended approximately 575 m in kimberlite. The purpose of this work is to test underground mining conditions under Snap Lake and to obtain a bulk sample of the kimberlite from this location. A 10-t/h diamond-processing plant will be used to process the underground bulk sample. During test mining it is anticipated that 20 000 t of kimberlite may be extracted. Plans are to process approximately 6000 t of this material to test for the recovered diamond grade and value.

A pre-feasibility study of mining the NW dike and detailed planning of required surface facilities are under way. Completion of these studies and submission of an Environmental Assessment Report is planned for the second quarter of 2000.

Jericho Property, Nunavut

In Nunavut, Tahera Corporation continues to work on the Jericho diamond project. The company has filed a project proposal and an application for a water permit for the Jericho diamond project that marks the formal commencement of the environmental assessment and regulatory approval process. The project proposal is for an open-pit diamond mine on the land-based JD/OD-1 kimberlite pipe near the northwest end of Contwoyto Lake, approximately 27 km northwest of the Lupin gold mine. Ore would be transported by an ice road (mid-January to mid-May) from the mine to a year-round processing plant (using conventional diamond-processing techniques) at the Lupin site. The kimberlite has an open-pit mineable resource of 2.345 Mt grading 1.13 ct/t. A pre-feasibility study completed in November 1999 utilized a diamond valuation of US$65/ct and recommended an annual production rate of 300 000 t, which would yield a mine life of eight years. A final feasibility study is in progress, scheduled for completion in the second quarter of 2000. The 10 527-ct parcel of diamonds extracted during the underground bulk sampling program has been re-valued at US$74/ct, up from the previous US$65/ct. The intent of a definition drilling program in the winter of 1999/2000 was to provide better definition of the geometry of the Jericho kimberlite between the 100 and 300-m levels and convert the resources in this area from inferred to indicated. The final feasibility study will consider both the increased value of the diamonds and the additional kimberlite outlined below the presently defined open-pit bottom. Tahera

is of the opinion that the mine life and economics of the Jericho diamond project are expected to improve significantly.

A 50.1-t mini-bulk sample extracted from the Contwoyto-1 kimberlite (discovered in the fall of 1998) yielded 13.60 ct of diamonds, for a preliminary diamond grade of 0.27 ct/t. Due to the relatively low grade, no further evaluation of the Contwoyto-1 kimberlite is planned at this time.

Tahera sold its bulk sample processing plant to Winspear Resources Ltd. and it has been moved to that company's Snap Lake deposit. Tahera indicates that it will be able to treat bulk sample material from any future kimberlite discoveries at its proposed full-scale diamond-processing plant. The company continues to explore its 93 000-ha Jericho Group property, with exploration focused on discovering more kimberlites in close proximity to the Jericho kimberlite.

Victor Project, Ontario

Monopros Limited, the Canadian exploration subsidiary of De Beers Consolidated Mines Limited, has been exploring for diamonds 90 km to the west of Attawapiskat in the James Bay Lowlands for some years. Twenty kimberlites have been found, the rights to 18 of which are held by Monopros. The pipes were discovered in the late 1980s. Sixteen of the 18 pipes have been drilled; 15 of the 16 are diamond-bearing.

Monopros is taking a 10 000-t bulk sample from the Victor pipe (52°48' N, 83°53' W). The first 2500 t of this was to be taken in the winter of early 2000 using a large-diameter drill. The other 7500 t will be taken from two trenches where the overburden is thinnest, with the 10 000-t bulk sample to be processed beginning in the spring at a custom-built treatment and recovery plant erected on site. The pilot plant, which uses heavy media and x-ray processing techniques, has a capacity of 10 t/d. Monopros expects to recover about 3000 ct of diamonds for valuation.

The Victor kimberlite appears to be the first potentially important kimberlite pipe discovered in Ontario in the approximately 50 years since Ontario's first kimberlite discovery was made.

Buffalo Hills, Alberta

Ashton Mining of Canada Inc., with a 44.7% share, is the operator of a diamond exploration project in the Buffalo Hills of northwestern Alberta. The other partners are Alberta Energy Company and Pure Gold Resources Inc. From early 1997 until the end of February 2000, a total of 34 kimberlites had been found on the property, of which at least 19 contain diamonds. The company has not yet found any kimberlites of economic interest, but is continuing exploration of the Buffalo Hills property.

Mineral Deposit Discoveries in Canada Over the Ten-Year Period 1990-1999

Table 4 is a listing of about 70 of the more than 140 mineral deposits discovered in Canada over the 10-year period 1990-99 inclusive. The discovery list is incomplete because no comprehensive search of public data sources has been undertaken. Also, over any 10-year period, a number of potentially important discoveries are made, the existence of which does not become public knowledge until years later.

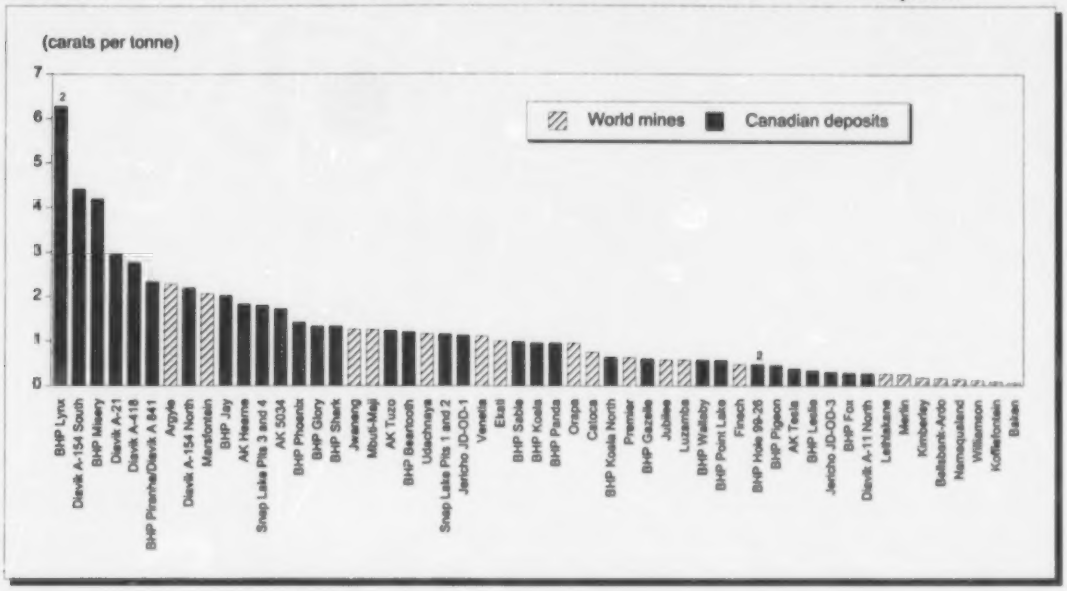
The approximately 70 discoveries made in the 1990-99 period that have been excluded from this table appear to be too small or too low of a grade to be of sufficient economic significance to be included in this discovery listing.

Notes: (1) Information in this review was current as of May 31, 2000. (2) This and other reviews, including previous editions, are available on the Internet at http://www.nrcan.gc.ca/mms/cmy/index_e.html.

Note to Readers

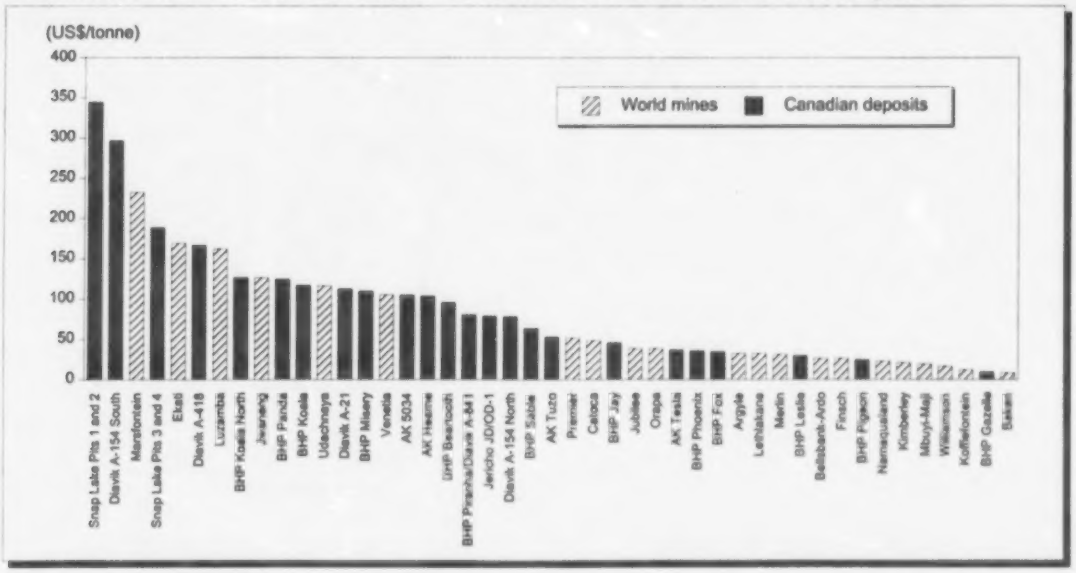
The intent of this document is to provide general information and to elicit discussion. It is not intended as a reference, guide or suggestion to be used in trading, investment, or other commercial activities. The author and Natural Resources Canada make no warranty of any kind with respect to the content and accept no liability, either incidental, consequential, financial or otherwise, arising from the use of this document.

Figure 3
Recoverable Diamond Grades From World Diamond Mines[1] and Canadian Diamond Deposits



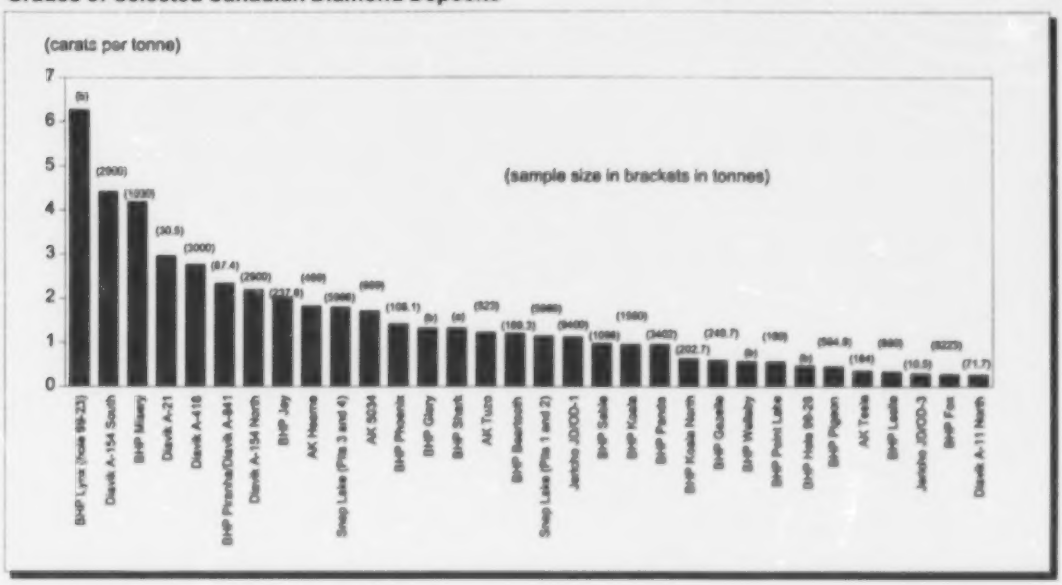
Source: Natural Resources Canada, based on published data.
[1] Grades of world diamond mines are 1999 production grades. [2] Based on a sample weight of a fraction of a tonne of drill core.

Figure 4
Recoverable Diamond Values for World Diamond Mines[1] and Canadian Diamond Deposits



Source: Natural Resources Canada, based on published data.
[1] Values for world diamond mines are 1999 production grades.

Figure 5
Grades of Selected Canadian Diamond Deposits



Source: Natural Resources Canada, based on published data.
(a) Sample size not available. (b) Based on samples of only a fraction of a tonne of drill core.

TABLE 1. SELECTED DATA ON CANADA'S MOST PROMISING DIAMOND DEPOSITS

Pipe	Total Tonnes Sampled	Total Carats Recovered	Average Grade (ct/t)	Average Value (US$/ct)	Average Value (US$/t)
EKATI MINE AND BUFFER ZONE PROPERTIES					
Panda	3 402	3 244	0.95	130	124
Misery	1 030	4 313	4.19	26	109
Koala	1 550	1 465	0.95	122	116
Koala North	201.7	126.58	0.63	200[a]	126
Fox	8 223	2 199	0.27	125	34
Leslie	680	233	0.33	89	29
Pigeon (original sample)	154	60	0.39	51	20
Pigeon (1998 sample)	564.8	251.31	0.45	54	24
Jay	237.6	476.8	2.01	22.50	45
Sable	1 096	1 070	0.98	64	63
Beartooth	189.3	227.09	1.20	79	95
Point Lake	160	90+	0.56	..	..
Phoenix (98-C)	106.1	149.2	1.41	25	35
Shark	..	..	1.32	..	..
Gazelle	240.7	141.4	0.59	15	9
Glory	0.2438	..	1.32	..	..
Wallaby	0.1208	..	0.57	..	..
Piranha (= A841) (straddles boundary of Buffer claims and Diavik property)	87.4	203.44	2.33	30	80
Lynx (hole 99-23)	0.2511	1.574[b]	6.27	..	..
Hole 99-26	0.1736	0.082	0.47	..	..
DIAVIK PROPERTY					
A-154 South	2 900	12 800	4.41	67	296
A-154 North	71.72	156.81	2.19	35	77
A-418	3 000	8 275	2.76	56	166
A-21	30.5	90	2.95	38	112
A-11 North	29	7.6	0.26	..	..
JERICHO PROPERTY					
JD/OD-1	9 400	10 539	1.12	70[d]	78[d]
JD/OD-3 (first sample)	10.53	7.34	0.697[c]	..	..
JD/OD-3 (second sample)	35.9	10.41	0.29	..	..
AK PROPERTY					
5034 (1999 bulk sample)	609	1044	1.71	63	104
Hearne	469	856	1.82	44[c]	103[e]
Tuzo	523	540	1.03	43	52
Tesla	..	..	0.37	96	36
Telsa (1999 bulk sample)	184	64	0.35	..	..
SNAP LAKE PROPERTY					
Snap Lake Dike (Pits 1 and 2)	199.7	226.7	1.14	301	344
Snap Lake Dike (Pits 3 and 4)	5 985.7	10 708.1	1.789	105	188

Source: Natural Resources Canada, based on company data.

.. Not available.

[a] Approximately 77% of the value is due to three gem-quality stones 3.26 to 5.41 ct in size. [b] Includes a 1.43-ct transparent brown octahedral diamond. [c] Includes a single 3.6-ct stone; if this stone is excluded, the grade is 0.25 ct/t. [d] Values have been revised to include stones larger than 10.8 ct that had been omitted in previously published values. [e] Values are based on previous smaller samples. Values of bulk samples listed are not yet available.

TABLE 2. DIAVIK PROJECT RESOURCE ESTIMATES

Unit	A-418 Pipe	A-154 South Pipe	A-154 North Pipe	A-21 Pipe	Total/Average
Resources (million tonnes)	9.0	12.0	11.5	4.9	37.4
Grade (ct/t)	3.7	4.8	2.4	3.0	3.5
Total (millions of carats)	33	57	28	15	133

Source: Natural Resources Canada, based on company data.

TABLE 3. ESTIMATED RESOURCES OF AK PROPERTY DEPOSITS

Pipe	Tonnage	Average Grade	Value Per Carat	Value
	(million tonnes)	(carats/tonne)	(US$)	(US$/tonne)
50341	12	1.71	63	104
Hearne[1]	6.9	1.71	65	111
Tuzo[1,2]	10.2	1.22	43	52
Tesla[3]	4.6	0.35	96	36

Source: Natural Resources Canada, based on company data.
[1] Modeled grade and revenues. [2] Revised data from 1999 bulk sampling program. [3] Values based on 1998 mini bulk sample; tonnage and grade based on 1999 bulk sample.

TABLE 4. PARTIAL LISTING OF MAJOR CANADIAN MINERAL DISCOVERIES, 1990-99

Province or Territory/ Project Name	Discovery Year[1]	Remarks
NEWFOUNDLAND AND LABRADOR		
Beaver Brook	1990	2 401 550 t grading 4.08% antimony at a cutoff grade of 1.5% antimony; the deposit is expected to be much larger.
Hammerdown deposit	1992	464 000 t grading 17.48 g/t gold.
Voisey's Bay deposit	1994	31.7 Mt grading 2.83% nickel, 1.68% copper, 0.12% cobalt and unspecified precious metals; and 105 Mt grading 1.2% nickel and unspecified copper, cobalt and precious metals; total of 136.7 Mt grading 1.71% nickel, 0.92% copper, 0.09% cobalt and unspecified precious metals. Also in 1999, intersected a thick zone of nickel mineralization at the Sarah target, 5.5 km north of the ovoid, and a zone grading 1.3% nickel over 29.5 metres in the Ryan's Pond area, 4 km southeast of the Eastern Deeps zone.
QUEBEC		
Bell Allard mine	1993	Proven 2 770 000 t grading 13.6% zinc, 1.21% copper, 0.12% lead, 36.7 g/t silver and 0.7 g/t gold; probable 576 000 t grading 12.77% zinc, 1.54% copper, 0.13% lead, 47.3 g/t silver and 0.7 g/t gold.
Caber deposit	1994	Measured, indicated and inferred 800 000 t grading 10% zinc, 0.6% copper, 11.6 g/t silver and 0.14 g/t gold.
Caber North deposit	1995	484 000 t grading 11.7% zinc, 1.0% copper and 15 g/t silver; inferred resources of 2.1 Mt grading 4.1% zinc, 1.5% copper and 19 g/t silver.
Perseverance deposit (at Matagami)	2000	Inferred resources of 947 000 t grading 19.12% zinc, 1.37% copper, 32 g/t silver and 0.4 g/t gold; drilling continues; reserves are not yet available for the thick, high-grade Perseverance West and Equinox zones.
Falconbridge Raglan project additional discoveries		
Katiniq	1995	A new lens containing 400 000 t grading 3.36% nickel and 0.83% copper.
Unnamed deposit	1995	Located 4 km east of Katiniq; 814 000 t grading 3.36% nickel and 0.83% copper.
East Lake	1998	1 153 000 t grading 3.71% nickel, 1.09% copper and 0.08% cobalt.
Zone 3	1999	295 000 t grading 3.3% nickel and 0.96% copper; 170-280 m below surface on a previously unexplored horizon that appears to extend across a significant portion of the company's Raglan property.
Lens 441	..	Located 300 m east of Lens 1040; undiluted indicated resource of 500 000 t grading 2.37% nickel and 0.64% copper.
Lens 1040 orebody	..	Diluted probable reserves of 1.26 Mt grading 3.23% nickel and 0.95% copper.
Zone 13-14	..	9 km east of Katiniq; 395 000 t grading 1.90% nickel and 0.51% copper (deep deposit, would have to be mined from underground).
Porphyry Mountain deposit (Noranda)	..	Located at Gaspé Copper; 206 Mt grading 0.7% copper.
Chevrier	..	8 300 000 t grading 2.3 g/t gold.
ONTARIO		
McCreedy East (Inco)	1990	Initial mining phase; 15 Mt grading 1.44% nickel and 4.32% copper (the deposit is considerably larger).
Victor (Inco)	1990	About 36 Mt averaging 2% nickel and 6% copper.

TABLE 4 (cont'd)

Province or Territory/ Project Name	Discovery Year[1]	Remarks
Nickel Rim Deep (Falconbridge)	1990	An extension of the Victor deposit onto the Falconbridge property; 1.6 Mt grading 1.58% nickel and 10.13% copper, or an inferred resource of 0.5 Mt grading 4.13% nickel and 25.53% copper.
Kelly Lake (Inco)	1996	10.5 Mt grading 1.77% nickel, 1.34% copper and 3.69 g/t platinum group metals.
Onaping Depth (Falconbridge)	1996	Indicated resource of 19.8 Mt grading 2.52% nickel and 1.21% copper; inferred resource of 0.9 Mt grading 3.70% nickel and 1.44% copper.
Norman West (Falconbridge)	1997	Inferred resource of 7.6 Mt grading 1.59% nickel and 1.28% copper.
Likely discovery at Sudbury (Falconbridge)	1999	8 km northwest of Lockerby and 3 km west of Creighton, a surface exploration hole intersected 33.4 m averaging 2.6% nickel and 0.8% copper at a depth of 436 m; the estimated true thickness of the zone is approximately 18 m.
Discovery near the former Totten mine (Inco)	1999	8.4 Mt averaging 1.42% nickel, 1.90% copper and 4.7 g/t platinum group metals.
Pump Lake (Inco)	1999	Two zones, each with a strike length of 200 m, with nickel and copper grades higher than the grade of ore currently being mined in Inco's Ontario Division. Exploration continues in 2000.
Mineralized zone, 1800 m north of Copper Cliff South mine shaft (Inco)	..	The tonnage and grade have not yet been released by Inco; depth is 900 m; thickness is 7.8 m; averages 5.90% nickel, 4.16% copper and 1.7 g/t platinum group metals; open at depth; exploration continues.
Big Whopper petalite deposit	1997	11.6 Mt averaging 1.34% Li_2O, of which 5.6 Mt average 1.41% Li_2O.
Big Mack petalite deposit	..	Tonnage and grade not yet published; adjacent to the Big Whopper deposit.
MANITOBA		
Photo Lake mine	1993	Mineable reserves were 533 623 t grading 4.5% copper, 6% zinc, 33 g/t silver and 4.7 g/t gold; the deposit is mined out; the tonnage and grade produced are unpublished.
Pipe #1 Deep deposit	1994	4 Mt grading 2.32% nickel.
Triple 7 deposit (Flin Flon) (Hudson Bay Mining and Smelting Co. Limited)	..	Currently being developed for production; 14.5 Mt grading 2.51% copper and 4.68% zinc.
William Lake (Falconbridge)	..	Falconbridge has been doing extensive drilling at William Lake for several years (located on the southwest extension of the Thompson Nickel Belt) and appears to have discovered a nickel deposit there. The tonnage and grade data have not yet been released.
SASKATCHEWAN		
Konuto Lake mine	1994	Mineable resources at January 1, 1999, were 1 550 159 t grading 4.00% copper, 1.20% zinc, 8.35 g/t silver and 1.84 g/t gold.
La Roque claims	1999	Three drillholes have intersected 6.95% uranium over 3.6 m, 25.36% uranium over 7.0 m, and 16.2% uranium over 2.5 m; exploration continues.
BRITISH COLUMBIA		
Kemess South mine	1990	250 000 000 t grading 0.22% copper and 0.6 g/t gold.
Kemess North deposit	1990	120 000 000 t grading 0.19% copper and 0.4 g/t gold.

TABLE 4 (cont'd)

Province or Territory/ Project Name	Discovery Year[1]	Remarks
Akaie deposit	1994	12 000 000 t grading 8.6% zinc, 1.5% lead and 17.1 g/t silver.
Gibraltar North deposit	1994	33 500 000 t grading 0.45% copper and 3 g/t silver.
YUKON		
Kudz Ze Kayah property		
Main deposit	1994	Indicated resource of 11 300 000 t averaging 5.89% zinc, 1.52% lead, 0.3% copper, 133.0 g/t silver and 1.34 g/t gold; inferred resource of 1 500 000 t averaging 6.4% zinc, 3.1% lead, 0.1% copper 90 g/t silver and 2 g/t gold.
Second discovery	1998	1 000 000 t averaging 6% zinc and 3% lead, plus copper with silver and gold.
Wolverine deposit	1995	6 237 000 t grading 1.33% copper, 1.55% zinc, 370.9 g/t silver and 1.76 g/t gold; as this deposit has a high selenium content, it may be impossible to market concentrates produced without reducing their selenium content.
Wolf deposit	1995	4 100 000 t grading 6.2% zinc, 1.8% lead and 84 g/t silver.
East Slope zone	1998	Tonnage and grade not available.
NORTHWEST TERRITORIES		
Ekati diamond mine		BHP Diamonds had indicated that the following nine kimberlites are viable orebodies. Still other diamond-bearing pipes known on the property are also likely to turn out to constitute mineable orebodies.
Panda Pipe	..	Open pit: proven and probable, 12.6 Mt grading 1.09 ct/t (US$130/ct); underground: proven and probable, 0.8 Mt grading 0.97 ct/t (US$130/ct).
Koala Pipe	..	Open pit: proven and probable, 14.6 Mt grading 0.76 ct/t (US$122/ct); underground: proven and probable, 2.8 Mt grading 1.63ct/t (US$122/ct).
Misery Pipe	..	Open pit: proven and probable, 5.5 Mt grading 4.26 ct/t (US$26/ct).
Fox Pipe	..	Open pit: proven and probable, 16.7 Mt grading 0.40 ct/t (US$125/ct).
Sable Pipe	..	Open pit: proven and probable, 12.9 Mt grading 0.93 ct/t (US$64/ct).
Leslie pipe	..	Tonnage not available; grade about 0.33ct/t (US$89/ct).
Beartooth pipe	..	Tonnage not available; grade about 1.20ct/t (US$79/ct).
Pigeon pipe	..	Tonnage not available; grade about 0.54 ct/t, value about US$54/ct.
Koala North	..	Tonnage not available; grade about 0.63ct/t, value about US$200/ct.
Diavik project (deposits going ahead to production):		
A-154 South Pipe	1994	12.0 Mt grading 4.8 ct/t (about US$296/t)
A-418 Pipe	1995	9.0 Mt grading 3.7 ct/t (about US$166/t)
A-154 North Pipe	1995	11.5 Mt grading 2.4 ct/t (about US$77/t)
A-21 Pipe	1995	4.9 Mt grading 3.0 ct/t (about US$112/t)
Snap Lake diamond deposit	1996	Exploration continues; indicated and inferred resource of 12.6 Mt grading 1.75 ct/t = US$206.50/t; considerable potential for additional ore with global resources for the dyke estimated at 21.3 Mt grading 1.97 ct/t.

TABLE 4 (cont'd)

Province or Territory/ Project Name	Discovery Year[1]	Remarks
AK (Kennady Lake) property		Exploration continues; four diamondiferous kimberlites have been defined to date:
5034 Pipe	1995	15 Mt grading 1.6 ct/t (US$ 51/ct; US$ 82/t)
Hearne Pipe	1997	8 Mt grading 2.33 ct/t (US$ 44/ct; US$ 103/t)
Tuzo Pipe	1997	9 Mt grading 2.2 ct/t (US$ 68/ct; US$ 150/t)
Telsa Pipe	1997	4 Mt grading 0.37 ct/t (US $ 96/ct; US$ 36/t)
NUNAVUT		
Hope Bay gold project	..	$85 million spent exploring the property to date, exploration continues.
Boston deposit	..	5.7 Mt grading 1.31 g/t gold (2.4 million oz of gold).
Doris Lake deposit	..	2.4 Mt grading 17.8 g/t gold (1.2 million oz of gold).
Madrid deposit	..	5 Mt grading 4.3 g/t gold (690 000 oz of gold).
Meliadine West and East properties		To date, some $45 million has been spent exploring the Meliadine West deposit; exploration continues.
Meliadine West	1990(?)	23.7 Mt grading 8.5 g/t gold (uncut) (6.5 million oz of gold).
Meliadine East	1992(?)	1.841 Mt grading 6.72 g/t gold (400 000 oz of gold).
Meadowbank property		Exploration continues.
Third Portage deposit	1990(?)	4 502 636 t grading 7.06 g/t gold (1 022 000 oz of gold). (open-pit resource).
North Portage deposit	1990(?)	2 019 000 t grading 4.49 g/t gold (291 000 oz of gold).
Goose Island deposit	1991	976 834 t grading 11.5 g/t gold (360 000 oz of gold).
Bay Zone	1997	684 000 t grading 4.71 g/t gold (104 000 oz of gold).
George Lake project		
George Lake and Goose Lake deposits	..	6.46 Mt grading 10.65 g/t gold (2 200 000 oz of gold); property being explored in 2000 by Kinross Gold Corporation with the goal of increasing the resource base by 35% to improve the economics of the project; exploration continues.
Inukshuk Zone (at Izok Lake)	1992	2 000 000 t grading 2% copper and 8% zinc.
Jericho diamond project	1995	Exploration continues; mineable resource in the JD/OD-1 pipe is 2.5 Mt grading 1.19 ct/t (US$75/ct); total resource of 7.1 Mt grading 0.84 ct/t.
OTHER DISCOVERIES IN CANADA		At least 70 additional discoveries of deposits have been announced that the author does not consider to be of sufficient current economic significance to be included in this listing.

Source: Natural Resources Canada.
.. Not available.
[1] Discovery year provided if readily available to the author.

Canadian Mine Openings, Closings, Expansions, Extensions and New Mine Developments

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OVERVIEW

A three-year, global metal price downturn that began in 1997 continued to have a negative effect on mining in Canada in 1999, causing more than double the number of mine closings over mine openings. During the year, 10 mines opened (including 6 new mines and 4 re-openings) and 24 mines closed (including 13 closures and 11 suspensions) (Tables 1 and 2). Six new mines came on stream consisting of 1 gold mine, 1 zinc-copper mine, 2 industrial mineral mines and 2 uranium mines. In addition, 4 mines re-opened, consisting of 2 gold mines and 2 base-metal mines. Of the 24 mine closings, 11 were production suspensions, including 9 gold mines and 2 base-metal mines, and 13 were permanent closures, including 5 gold mines, 5 base-metal mines, 1 coal mine, 1 sodium sulphate mine and 1 uranium mine. Two of the mine openings, both new mines, and two of the mine closings (one suspension and one closure) involved Canadian and foreign joint ventures. In addition, one Canadian junior company joined the rank of producer in Canada in 1999.

The new mines opened in 1999 were: the Shabogamo high-purity silica mine in Newfoundland, the Bell Allard zinc-copper mine and the East Amphi gold mine in Quebec, the Kapuskasing phosphate mine in Ontario, and the McClean Lake and McArthur River uranium mines in Saskatchewan. The mines re-opened during the year included the Hislop West gold mine in Ontario, the Highland Valley Copper mine and the Myra Falls zinc-copper-gold-silver mine in British Columbia, and the Con gold mine in the Northwest Territories.

The most important new mines in 1999, in terms of value of expected production and employment, were McArthur River and McClean Lake in Saskatchewan, Bell Allard in Quebec, and Kapuskasing in Ontario.

The year 1999 marked the closures of nine significant mines in Canada. In Nova Scotia, the Phalen coal mine closed in December as the result of chronic high costs and irreversible damage from roof caving and water problems. In New Brunswick, the Heath Steele zinc-copper-lead-silver mine, which first began production in 1957, closed in October. Mines Gaspé in Quebec also closed in October after 45 years of production. In Ontario, the Detour Lake gold mine near Timmins, in production since August 1983, closed in June. As well, the Levack, McCreedy West and Little Stobie nickel-copper mines in Sudbury closed in the summer. Production at Levack first began in 1913 and both McCreedy West and Little Stobie came on stream in the early 1970s. The Key Lake uranium mine in Saskatchewan, that had produced since August 1981, closed in June. The Snip gold mine in British Columbia closed in May after nine years of operation. Except for the Phalen mine, all of these mines closed due to the depletion of economically mineable ore.

In addition to production suspensions and mine closures, numerous production cutbacks continued throughout 1999, especially at coal mines, which created substantial employment losses during the year. Job losses through production cutbacks amounted to at least 900 in 1999, higher than the 700 estimated for 1998, and the largest such losses since 1992 when 32 mines closed.

In an effort to cut costs, mining consolidations through mine integration continued to take place in 1999, notably the further integration of mining operations at McWatters Mining Corporation's Sigma gold mine (the Sigma-Lamaque complex) in Quebec, at Claude Resources Limited's Seabee gold mine in Saskatchewan, and at Miramar Mining Corporation's Con gold mine in the Northwest Territories.

In 1999, there were at least 11 metal mine expansion and extension projects of significance across Canada (Table 2). Although most of these projects were the continuation of existing programs that began in recent years, many capital programs were revised by the companies involved by using new exploration and development data that are expected to result in higher efficiency and higher production at lower costs, thereby enabling the companies to be more competitive. Important expansion programs that

continued in 1999 were the Carol Lake and Wabush Mines iron ore operations in Labrador; the Doyon and Sigma (the Sigma-Lamaque complex) gold mines and the LaRonde gold-zinc-copper-silver mine in Quebec; and the Campbell gold mine, the McCreedy East and Creighton nickel-copper mines, and the Lac des Îles palladium-platinum-base-metal mine in Ontario. One significant new expansion program was announced in 1999 – the Niobec niobium mine in Quebec.

Despite continued weak metal prices, the decline in the number of mine openings experienced in 1998 (9 mines opened) was halted in 1999 when 10 mines opened. However, the total capital cost for bringing new and re-opened mines into production in 1999, estimated at about $850 million, is lower than the $1.4 billion estimated for mines that came on stream in 1998. For 1999, the bulk of the capital investment reflects the capital costs of developing the McClean Lake and McArthur River uranium mines in Saskatchewan whereas, for 1998, the bulk of the capital investment reflected the capital costs of developing the Ekati diamond mine in the Northwest Territories and the Kemess South gold-copper mine in British Columbia. Given the depressed mineral commodity prices and market conditions, the level of capital investment was relatively high in recent years compared with exploration expenditures. However, most of the capital investments in Canada in 1999 were not for the development of gold and base-metal mines. At least another $250 million is estimated to have been spent on mine expansions and extensions, about the same as in 1998. Preliminary estimates indicate that the total capital investment required for bringing new mines and mine re-openings on stream in 2000 and 2001 will be about the same as, or slightly higher than, in 1999. As at least two world-class mines (one uranium and one diamond) are expected to come on stream in Canada over the next two to three years, capital investment is expected to rise in 2002 and 2003.

REGIONAL PERSPECTIVE

During 1999, nine provinces and territories experienced mine openings or closings. Quebec, Ontario and British Columbia were particularly hard hit as mine closings in these provinces exceeded mine openings, resulting in large net losses in ore capacity and employment.

Newfoundland

In Newfoundland, the Shabogamo silica mine near Smoky Mountain was opened in July by Shabogamo Mining and Exploration Co. Ltd., creating some 30 mining jobs. The mine is expected to produce 100 000 t/y of high-purity silica for SKW Canada Inc.'s ferroalloy plant at Bécancoeur, Quebec, for 10 years. However, with ore reserves of 5 Mt, the mine life could easily be extended beyond 20 years.

Nova Scotia

The Phalen colliery near Waterford in Nova Scotia, the largest coal mine in the province, closed in December due to irreversible damages caused by underground roof caving. The 6000-t/d underground mine was brought on stream in 1987. However, over the years, production costs were high due largely to the depth of the mine under the ocean floor and frequent roof caving and water problems. More than 600 workers were employed at the mine during the peak production period. At the time of closure, fewer than 450 workers remained on site.

New Brunswick

In New Brunswick, the Heath Steele zinc-copper-lead-silver underground mine, near Newcastle, closed in October as a victim of lingering low metal prices that accelerated the exhaustion of economically mineable ore. The mine first began production in 1957 as an open-pit mine and, during its 43-year mine life, expanded ore capacity to 3200 t/d from its initial capacity of 1360 t/d. Production at the mine was suspended four times (in 1958, 1978, 1984 and 1993) due largely to low metal prices. As there were no mine openings in 1999, the province suffered net losses of 3200 t/d of daily ore capacity and 300 mining jobs. With the closure of the Potacan potash mine in 1997 and the suspension of production at the Caribou and Restigouche zinc-lead mines near Bathurst in 1998, the Brunswick zinc-lead-copper mine is the only metal mine and one of the two large mining operations left in the province (the other being the New Brunswick Division potash mine near Sussex).

Quebec

In Quebec, two new mines opened and five mines closed. The $133 million, 2000-t/d Bell Allard zinc-copper underground mine near Matagami was brought on stream by Noranda Inc. in January, creating 200 new jobs. The mine was developed in time to supply ore to Noranda's nearby Mattagami mill to avoid the shutting down of the company's mining and milling operations at Mattagami Lake. The Matagami Division mines nearly ran out of ore when ore reserves at the Isle Dieu and Norita East mines were depleted at the end of November 1997 and subsequent development ore from the Norita West orebody was insufficient to sustain continuous zinc concentrate production at the mill. The 800-t/d East Amphi open-pit gold mine at Malartic also opened in January, but the pit ore was mined out in eight months. While the result of a feasibility study to develop the underground ore was positive, a production decision, which hinges on the price of gold, has not yet been made. During 1999, the five mine

closings included three closures and two suspensions. The most significant closure was Mines Gaspé. This 5500-t/d copper mine closed in mid-October due to ore depletion after 45 years of production. The small Joubi gold mine near Val-d'Or was mined out at the end of October and the short-lived East Amphi open-pit gold mine ceased operation in August. In addition, production was suspended at the Joe Mann gold mine near Chibougamau and the Francoeur gold mine near Rouyn-Noranda to revamp mining methods in an effort to cut costs. Both Francoeur and Joe Mann have since re-opened for production in February and April 2000, respectively. On balance, Quebec incurred net losses of some 5360 t/d of ore capacity and 650 mining jobs from mine openings and closings in 1999.

Ontario

In Ontario, two mines opened and nine closed. The 3500-t/d Kapuskasing open-pit phosphate mine near Kapuskasing began production in August 1999. About 100 new jobs were created. It is Canada's first large phosphate mine. Developed over two years at a capital investment of US$70 million, the high-grade, low-cost mine is expected to supply 100% of the phosphate rock required by the owner's (Agrium Inc.) Redwater fertilizer plant in Alberta to produce monoammonium phosphate for the next 20 years. Prior to the start of production at Kapuskasing, Agrium had relied, since 1986, on imported phosphate rock from Togo, Africa. In addition, the 500-t/d Hislop open-pit gold mine near Matheson re-opened in July through the development of the West Zone. Ore is treated at the company's Stock mill and gold production is estimated to be 20 000 oz/y over less than two years at a cash cost of US$195/oz. The company plans to use the cash flow to develop the nearby Taylor gold project.

Of the nine mine closings in Ontario in 1999, two were gold mine closures and three were base-metal mine closures. The Detour Lake gold mine near Matheson and the Lakeshore gold tailings operation near Kirkland Lake both closed in June. The Levack, McCreedy West and Little Stobie nickel-copper mines at Sudbury all closed in the summer. All five closed as the result of exhaustion of economic ore. In addition, production was suspended at four gold mines, namely, the Macassa mine at Kirkland Lake and the Madsen mine near Red Lake in June, and the Nighthawk and Pamour mines at Timmins in September. Although final reasons for the suspensions varied, they were largely related to low gold prices. The David Bell concentrator near Marathon was shut down permanently in mid-June to cut costs. Gold ore from the mine is now being processed at the nearby Williams mill.

With net losses of seven mines, some 14 700 t/d of ore production capacity and 900 mining jobs, Ontario's mining industry suffered the heaviest blow among all provinces and territories in 1999.

Saskatchewan

In Saskatchewan, two mines opened and two closed in 1999. The two mines opened are both world-class uranium mines. Mining began at the 275-t/d McClean Lake open-pit and underground mine in June. The mine, developed at a capital cost of $200 million, is scheduled to produce 6 million lb of U_3O_8 (2308 tU) annually. The mill capacity will be expanded to accommodate ore from the Cigar Lake mine, which is under development for production in late 2002. The McClean Lake uranium deposit has an overall mineable reserve of 17 300 tU. The average ore grade is currently running at 2.7%, with underground ore increasing to 4% at a depth of 170 m. The mine is the first Canadian, French and Japanese mining joint venture in Canada with COGEMA Resources Inc. of France holding a 70% controlling interest, Denison Mines Limited of Canada holding 22.5%, and Japanese-owned OURD (Canada) Co., Ltd. holding 7.5%. The $400 million, 125-t/d McArthur River mine began production in early December. Ore is processed at the Key Lake mill, some 80 km southwest of the mine. With overall reserves and resources outlined at 186 000 tU, including 98 000 tU currently in the mineable category, and an ore reserve grade averaging 17% U_3O_8 and a resource grade averaging 12.03% U_3O_8, the McArthur River deposit is the world's largest high-grade uranium deposit. Annual production is expected to be 18 million lb of U_3O_8 (6924 t of uranium). The mine is a joint venture between Canada's Cameco Corporation, which owns a 69.805% interest in the project, and French-controlled COGEMA Resources Inc., which owns the remaining 30.195%.

The Key Lake uranium mine at Key Lake in northeastern Saskatchewan closed in June after 19 years of operation due to ore depletion. The mill has been modified to process high-grade ore from the McArthur River mine, which began production in December (see above). As well, the Horsehoe Lake sodium sulphate operation at Ormiston in the southern part of the province closed in January due to the depletion of brine reserves.

Overall, the two new mines created 650 direct mining jobs and the two mine closures created 300 job losses in Saskatchewan, resulting in a net gain of some 350 new jobs for the province in 1999.

British Columbia

During 1999, two mines re-opened, production at three mines was suspended and one mine closed in British Columbia. The 4000-t/d Myra Falls zinc-copper mine near Campbell River on Vancouver

Island re-opened in March, one month ahead of schedule. Production had been suspended at the mine in December 1998 due to poor ground conditions that were causing excessive ore dilution which led to lower head grades. During the shut-down, the mine underwent $15 million of rehabilitation and additional underground development. At full production, the mine produces some 60 000 t of zinc, 20 000 t of copper, 32 000 oz of gold and 1 million oz of silver annually and is one of the most important base-metal producers in the province. The 37 650-t/d Gibraltar open-pit copper mine at McLeese Lake in the southeastern part of the province suspended production in February due to low copper prices, laying off 267 workers. Subsequently, in April, Taseko Mines Limited acquired the mine from owner Boliden Limited and kept it on care and maintenance with the intention to re-open it when copper prices improve. In mid-May, production was suspended at the 125 000-t/d Highland Valley Copper (HVC) open-pit copper-molybdenum mine near Logan Lake in southern British Columbia due to a labour dispute. The mine re-opened in late August after an agreement was reached between the union and the company that ties miners' wages to copper prices. All 1064 mine workers were recalled. The HVC mine is Canada's largest producing copper mine.

The small but relatively high-grade Blackdome underground gold mine near Clinton suspended production in May due to low gold prices. The mine was first brought on stream in 1986 by Blackdome Mining Corporation. Originally outlined ore reserves were depleted in 1990. Claimstaker Resources Ltd. acquired the property in 1995. New ore was subsequently discovered and developed for re-opening in October 1998. After nine years of operation, the 475-t/d, high-grade Snip gold mine near Stewart closed in May. As a result of these mine openings and closings in 1999, the province suffered significant net losses of over 34 000 t of daily ore capacity and 880 mining jobs.

Yukon

The Yukon's economy continued to suffer in 1999, with another mine closing and no mine openings. Production at the 700-t/d Mount Nansen gold-silver mine near Carmack was suspended in February due to low gold prices. About 50 miners lost their jobs. At the time of closing, ore reserves at the producing orebody were near exhaustion. Although other ore zones exist and B.Y.G. Natural Resources Inc. intended to develop them for production, the company soon went into receivership. The Yukon now has only one producing mine remaining – the Brewery Creek gold mine near Dawson Creek.

Northwest Territories

In the Northwest Territories, the 550-t/d Con gold mine in Yellowknife re-opened in June after a year-long strike. In December 1999, mine owner Miramar Mining Corporation acquired the nearby Giant gold mine from the federal Department of Indian Affairs and Northern Development and announced that it will combine the Con and Giant operations to produce 130 000 oz of gold per year at an average cash cost of US$260/oz. Production from the Con mine is planned at 100 000 oz/y, with the remaining 30 000 oz from the Giant mine's Supercrest Zone. As a condition of sale, the Giant mine, previously owned by the defunct Royal Oak Mines Inc., was closed in September to facilitate the acquisition by Miramar. The 1000-t/d Giant mine was subsequently redeveloped and re-opened in February 2000 but at a drastically reduced scale. As a part of the corporate strategy to consolidate operations and reduce production costs, the Giant mill was closed and underground activity at Giant was limited to the development and mining of the higher-grade Supercrest Zone, with ore mined being processed at the Con mill. Overall, in 1999, the Northwest Territories incurred a net loss of some 450 t/d of gold ore capacity but few net job losses.

MINE EXPANSIONS AND EXTENSIONS

Despite continued low metal prices throughout most of 1999, at least 11 significant gold and base-metal mine expansion and extension projects were initiated or undertaken in the year (Table 2): 5 in Quebec, 4 in Ontario, and 1 in each of Manitoba and Saskatchewan. The majority of these projects involved the completion of existing programs and several further extensions at gold mines.

Quebec

In Quebec, significant quantities of new gold ores continued to be found at depth and in the surrounding areas of the Doyon-Mouska and Sigma-Lamaque mining complexes and at the Kiena and LaRonde mines, resulting in a further extension of the life of these mines. At the end of 1999, ore reserves at the Doyon Division stood at 10.623 Mt grading 6.3 g/t gold, with an additional 3.04 Mt grading 2.8 g/t gold in the measured and indicated categories and 7.94 Mt grading 4.8 g/t gold in the inferred category. Exploration has established that, in general, ore grades are higher at depth. After producing 242 800 oz of gold in 1999, total contained gold in all categories amounted to 3.667 million oz of gold, about the same as the 3.664 million oz in 1998. Capital investment at Doyon was $4.4 million in 1999 and is expected to increase to $11 million in 2000 to continue development of the production block on level 12 and to complete the internal shaft and lower levels at Mouska. Production costs at the Division also continued to improve. In 1999, the average cash cost of gold production was US$203/oz, down 10% from 1998.

A $256 million expansion and mine life extension program, which started in 1997, continued in 1999 at the LaRonde gold-zinc mine near Val-d'Or. In the Phase 1 expansion program that concluded in 1999, ore capacity was increased to 3265 t/d from the original 1800 t/d, with production reaching the new capacity level in the first quarter of 2000. However, the higher-than-expected ore thickness on zones accessible from shaft 3 caused the company, Agnico-Eagle Mines Limited, to plan a further expansion. A revised Phase 2 capital investment plan, designed in 1999, calls for an additional US$34 million to further increase the ore capacity to 4535 t/d, increasing expenditures on the two-phase expansion program to US$218 million. The expansion is expected to result in a greater rate of return and a shorter payback period. At the start of 2000, about US$120 million remained to be spent over the next 3.5 years. The new mill expansion is expected to be completed by the fourth quarter of 2000. Gold production is expected to more than double the mine's 1998 output of 150 000 oz to 337 000 oz in 2004 at a cash operating cost of US$104 per short ton (st) after by-product credits, making the mine one of the lowest-cost gold mines in the world. At the beginning of 2000, mine reserves stood at 3 million oz of contained gold, with an additional 3.1 million oz in the resource category. There is good potential to increase mine reserves as major ore zones are open at depth.

Since acquiring the Kiena mine and the Sigma-Lamaque comp'ex from Placer Dome North America in 1997, McWatters Mining Inc. embarked on a US$23 million expansion and reserves extension program to increase ore reserves and production and to cut costs. During 1999, significant new ore, including that from the Sigma 2000 ore zone, boosted the near-surface ore reserves at Sigma-Lamaque to 16.3 Mt grading 3.02 g/t gold, or 1.6 million oz, in the first quarter of 2000. An additional 12.5 Mt grading 1.18 g/t gold are in the measured and indicated category. Another 33 Mt of mineralized material has also been identified along extensions of existing ore zones. This new reserves base is in stark contrast to the former ore reserves of 3.8 Mt grading 3.28 g/t gold. McWatters is spending $1.9 million to expand the Sigma mill capacity to 3000 t/d from the current 2000 t/d by July 2000. Another $2 million has been budgeted to further expand the mill capacity to 4000 t/d by the second quarter of 2001. As a result of capacity expansion, gold production from the complex is expected to rise to 155 000 oz in 2001 from 82 000 oz in 1999. Cash operating costs are expected to drop to US$120/oz in 2002 from US$243/oz in 1999. The company is contemplating a further capacity expansion to an ultimate 7000-t/d level.

A $1.1 billion, six-year comprehensive capital investment program announced by the Iron Ore Company of Canada (IOC) in October 1998 continued in 1999. About 60%, or $650 million, of the investment will be spent on upgrading and expanding the company's Carol Lake (Labrador West) mine, concentrator and pellet plant operations, and $361.5 million will be spent on refurbishing and reactivating the pellet plant at Sept-Îles, which was mothballed in 1982. The plant, scheduled to re-open in 2002, will create 140 long-term jobs and require up to 700 workers during the refurbishing phase. Overall, the capital investment program is expected to result in modernized, better integrated and expanded IOC operations in Labrador and Quebec.

A $15.7 million, two-phase capital program launched in 1998 to deepen the production shaft and to develop deep ore at the Niobec niobium mine near Chicoutimi was under way in the third quarter of 1999. With the addition of new reserves in the lower or "third" block, total mine reserves now stand at 10.6 Mt grading 0.52% Nb_2O_5, sufficient to sustain the mine life until at least 2010. Initial production from the Phase 1 program is expected to start in the fourth quarter of 2000. Capacity will be increased by 20% as the market warrants. The Phase 2 expansion, to begin at an unspecified date, will increase production by another 20%. Key capital costs for the production expansion in Phase 1 will be about $4.7 million and, for the further expansion in Phase 2, less than $2 million. Production is expected to be 2400 t of contained niobium in 2000, up from the 2300 t in 1999 and 2177 t in 1998.

Ontario

In Ontario, major expansion and extension programs occurred at several precious and base-metal mines. Higher palladium prices and exploration success in 1998 have encouraged North American Palladium Ltd. to embark on a major capital program to expand production at its Lac des Îles palladium mine near Thunder Bay. The expansion program will see the mine's open pit enlarged and the mill capacity increase to 15 000 t/d from the current 2400 t/d by mid-2001. At the start of 2000, ore reserves stood at 74.2 Mt grading 1.64 g/t palladium, 0.18 g/t platinum, 0.14 g/t gold, 0.07% copper and 0.06% nickel with a mine life of 11 years. Annual production at the expanded rate is expected to be 248 900 oz of palladium, 24 200 oz of platinum and 19 100 oz of gold, plus copper, nickel and cobalt credits, at an average cash cost of US$131/oz of palladium. The total capital cost of this expansion program is estimated at US$126.5 million. The mine is Canada's only primary palladium producer and is the second largest primary palladium mine in North America.

The US$51 million depth development program at the Campbell gold mine at Balmertown that started in 1997 was nearing completion in 1999. The 1820-m-deep circular Reid shaft, originally scheduled to be completed in mid-1998, was completed and commissioned one year later. The shaft provides a second

more efficient underground access and enables exploration drilling to greater depths. However, a significant part of the mine property remains to be explored and a number of existing ore zones could be expanded. Ore reserves as of December 31, 1999, were 4.044 Mt grading 14.5 g/t gold, or 1.89 million oz, sufficient for more than seven years of production at the current rate. The mine is expected to maintain the current 300 000-oz level of gold production in 1999, at a cash cost of US$140/oz, maintaining Campbell's status as one of the lowest-cost gold producers in Canada.

Impressive exploration successes in recent years at Goldcorp Inc.'s Red Lake gold mine, adjacent to the Campbell mine, catapulted the mine to the development stage in the fall of 1999. The mine, where production was suspended since a strike broke out on June 23, 1996, is scheduled to re-open in November 2000. The capital cost for redeveloping and re-opening the mine is estimated at US$56 million. The discovery of the rich High Grade Zone was the key for its redevelopment into a world-class high-grade gold mine. Gold production is projected to be 240 000 oz/y at a cash cost of US$88/oz, which would make this the lowest-cost gold mine in Canada. As of December 31, 1999, ore reserves at the mine were estimated to contain 2.9 million oz of gold. About 2.32 million oz of the gold reserves were contained in 1.70 million st (or 1.54 Mt) of ore reserves grading 1.37 oz/st in the newly outlined High Grade Zone. The remaining reserves of 570 000 oz (0.6 million oz), in ore with an average grade of 0.36 oz/st, were in the sulphide zones that run parallel to the High Grade Zone. Goldcorp Inc., the owner and operator of the mine, continued to discover and outline exceptionally high-grade ores in 2000 and has indicated that, while the High Grade Zone has been given top priority for development in 1999, drilling outside the zone will be given prominence in 2000.

In the Sudbury area, major expansion and ore reserves extension work continued at two of Inco Limited's mines. A $194 million capital program to fully develop the McCreedy East nickel-copper mine and to expand ore production capacity since its opening in 1996 was completed in 1999. When in full production, the mine is expected to produce 14 500 t/y of nickel and will be one of the lowest-cost nickel-producing mines in Ontario. The US$125 million, two-phase expansion and extension program at the Creighton nickel-copper mine moved into high gear in 1999. The goal of the program is to extend the mine life at Creighton to about 20 years. Phase 1, which began in late 1998, will develop proven reserves of 2.8 Mt grading 3.45% nickel and 2.97% copper located between the 7400 and 7660 levels. Production from these ore reserves is scheduled to start in 2001 and to continue through 2013. Phase 2 will develop 3.1 Mt of probable reserves grading 3.62% nickel and 3.25% copper that are situated between the 7660 and 8180 levels for production between 2005 and 2019. When fully on stream, annual production from Creighton is expected to be 10 900 t of nickel, 9500 t of copper and 28 000 oz of platinum group metals. Creighton, together with Copper Cliff North, Copper Cliff South and McCreedy East, are Inco's four key and lowest-cost mines in the company's Ontario Division. With the closure of the Shebandowan mine near Thunder Bay in 1998, all of Inco's producing mines in Ontario are in the Sudbury area.

Manitoba

In September 1999, Harmony Gold Mining Company Limited launched a $6 million capital program to expand its Bissett (formerly San Antonio) gold mine northeast of Winnipeg to increase production and to cut costs. The mill capacity is expected to increase to 900 t/d from 635 t/d in 2000, with the cash cost dropping to US$220/oz from US$278/oz prior to the expansion in 1999. Production is planned at 60 000 oz/y. At the start of 1999, ore reserves stood at 2 Mt grading 8 g/t gold. The expansion program also includes further delineation drilling to increase ore reserves.

Saskatchewan

In early 1999, the Currie Rose gold property adjacent to the Seabee gold mine near La Ronge was brought on stream, integrated with the Seabee mine. The addition of Currie Rose boosted Seabee's mine reserves to 507 000 t grading 8.56 g/t gold, with an additional 346 000 t in the possible category. Exploration has also identified a resource potential of 1.5 Mt on the Seabee/Currie Rose property and high-grade mineralization has been encountered during underground development at Currie Rose.

British Columbia

An expansion was under way at the Cassiar asbestos operation at Cassiar in 1999. By the end of October 1999, the mine had reached commercial production with its milling capacity expanded to produce 40 000 t/y of chrysotile fibre from tailings and low-grade stockpiles. Cassiar Mines and Metals Inc. (formerly Minroc Mines Inc.), owner of the Cassiar operation, is examining the possibility of a magnesium extraction operation on site.

Northwest Territories

At the Ekati diamond mine at Lac de Gras, development is under way to expand production. The plan is to bring the Koala and Misery pipes on stream in 2002 and to double diamond production soon thereafter. Current production comes mainly from the Panda pipe open pit, which runs at 9000 t/d of ore throughput, producing 3 Mct/y of diamonds.

Overall, the major mine expansion and extension programs described above indicate that, despite continued weak metal prices, many mining companies in Canada continue to discover new ore at existing mines that enable them to extend mine lives and expand production. Expansion also enables the mines to reduce production costs and to stay competitive and economically viable. Although in the majority of cases such expansions or extensions seldom resulted in large increases in new jobs, a significant number of new jobs, both during the construction phase and the long-term operating phase, were created in Quebec at the Niobec mine and at the Sept-Îles iron plant in connection with IOC's overall modernization and expansion of its iron ore operations in Labrador and Quebec in 1999. A significant number of new jobs can be expected at the Lac des Îles mine in Ontario in 2000.

IMPACT

In 1999, new mines and re-openings brought on stream some 137 000 t of daily ore capacity and created 2700 mining jobs. However, about 202 000 t/d of ore capacity and 4850 jobs were lost from mine closures and production suspensions, resulting in a net loss of 14 mines, significant net losses of 65 000 t of daily ore capacity, and more than 2850 direct mining jobs, the greatest losses since 1992. Although the Highland Valley Copper mine appeared to have contributed to most of the gains and losses during the year, it did not result in any net gain or loss in capacity or employment as the mine closed and then re-opened before year-end 1999. The real causes for most of the net gain in ore production capacity in 1999, therefore, came from two new mines, the 2000-t/d Bell Allard zinc-copper mine in Quebec and the 3500-t/d Kapuskasing phosphate mine in Ontario, as well as from the re-opening of the 4000-t/d Myra Falls zinc-copper mine in British Columbia. In comparison, most of the net loss in capacity came from the closure of the 6000-t/d Phalen coal mine in Nova Scotia; the 3200-t/d Heath Steele zinc-copper-lead-silver mine in New Brunswick; the 5500-t/d Mines Gaspé copper mine, the Levack, McCreedy West and Little Stobie nickel-copper mines that together amounted to 9000 t of daily ore capacity, and the 3500-t/d Detour Lake gold mine in Ontario; and the suspension of the 37 650-t/d Gibraltar copper mine in British Columbia and the 1000-t/d Giant gold mine in the Northwest Territories. These mines also accounted for the bulk of the mining employment losses due to mine closings in Canada in 1999 (about 2430, or 64%). In addition, production cutbacks also resulted in substantial job losses during the year, especially at gold, base-metal and coal mines. Total job losses due to production cutbacks during the year were estimated at more than 900, nearly a 30% increase over the number of losses in 1998 and the third consecutive year of job losses due to cutbacks at producing mines across Canada. Although a significant number of jobs were created in Canada each year between 1994 and 1997 from mine expansions and extensions, fewer than 100 jobs were estimated to have been created this way since 1998 to help offset the negative impact of job reduction through production cutbacks. However, expansions and extensions enable mines to retain a number of mine workers whose jobs would otherwise have been eliminated through production cutbacks.

Mine openings ensure immediate access to new or redeveloped sources of economic mineral supply, new production capacity and capability, and new mining jobs. They not only reflect Canada's mine-building ability, but also its attractiveness in the face of globalization and global competition. In 1999, mine openings continued to contribute significantly to Canada's total minerals and metals production. At full capacity, production from new and re-opened mines in 1999 is expected to add some 5.38 t (173 000 oz) of gold, 31.1 t (1 million oz) of silver, 29 000 t of copper, 160 000 t of zinc, 9232 t of uranium (24 million lb of U_3O_8), 1.1 Mt of phosphate rock, and 100 000 t of high-purity silica annually (Table 3) to Canada's total mineral production. While most of the new gold production (58%) will come from the Con mine in the Northwest Territories, most of the silver (>90%) and copper (69%) will come from the Myra Falls operation in British Columbia and the new zinc production will be entirely from the Bell Allard mine (63%) in Quebec and from Myra Falls (37%). All of the new uranium production will come from the McClean Lake and McArthur River mines in Saskatchewan. All of this new production is essential for offsetting production losses from mine closings and for maintaining Canada's mineral production from existing mines. Except for the two small gold mines in Quebec and Ontario, most of the new mines are expected to have a mine life of more than five years. A mine life of at least 15 years can be expected at the McArthur River uranium mine.

Table 4 shows that new and re-opened mines in 1999 have also added over 26.5 t, or 851 850 oz, of gold reserves; 391 t, or 12.57 million oz, of silver reserves; 149 700 t of copper reserves; 963 000 t of zinc reserves; and 203 300 t of uranium reserves to Canada's total reserves of these metals. In addition, some 8.4 Mt of phosphorous pentoxide and 5 Mt of high-purity silica reserves have been added. All of the new metal reserves are essential for replenishing depleted reserves due to production and for sustaining Canada's minerals and metals production capability. While phosphorous reserves added diversification to Canada's mineral production, the new uranium reserves firmly ensure Canada's position as the world's largest long-term supplier.

New Developments Expected to Become Mines in 2000

Preliminary estimates, based on mine development activities in 1999 and in the first quarter of 2000, indicate that at least 10 mines could come on stream during 2000. However, few will be new mines; most will be re-openings. Among the most promising new mines are the Magnola magnesium operation (by processing asbestos tailings) in Quebec and the Chisel North zinc-copper project in Manitoba. Mine re-openings will likely include the Francoeur and Joe Mann gold mines and the Saint-Onge wollastonite mine in Quebec, the Red Lake and Stock gold mines in Ontario, the Giant gold mine in the Northwest Territories, and the Lupin gold mine in Nunavut. In fact, production had already resumed at the Joe Mann, Francoeur, Saint-Onge, Stock and Giant mines in the spring of 2000. All of the mine re-openings underwent redevelopment work to redefine ore reserves, cut costs and streamline operations.

In addition, several previous mine expansion and extension projects, as well as new ones that were initiated in 1999, are expected to continue in 2000 with others likely be announced during the year. These expansions and extensions, together with new mine developments, are central to sustaining mining and production in Canada. In the face of weak prices for many minerals and metals and without having to resort to layoffs, mine expansion remains an effective option by which production costs can be lowered and productivity increased at an existing mine. Such an option is especially beneficial for mines that have significant new ore discoveries, for example, the LaRonde, Sigma and Norbec mines in Quebec and the Campbell, Red Lake, Lac des Îles, Copper Cliff North, Copper Cliff South, McCreedy East and Creighton mines in Ontario.

Outlook

The metal price down-cycle from 1997 to 1999 not only caused a major drop in metallic mineral exploration worldwide, but also negatively affected mine development in Canada and in most parts of the world. This was reflected in the declining number of mine openings in Canada's traditionally strong areas of gold and base metals during the period. In addition, coal mining in Canada was hit hard by lingering weak metallurgical coal prices, which plummeted further to below the US$40/t (f.o.b.) level in early 2000. Throughout 1999, Canadian companies continued to respond by closing high-cost mines, consolidating operations by integrating mines, cutting back on production to keep marginal operations afloat (which included extended summer shut-downs), and postponing mine openings and developments.

Gold and base-metal prices have shown signs of recovery since the summer of 1999, partly due to the gradual recovery of the Asian economy from the Asian financial crisis and partly due to the positive announcements of the International Monetary Fund (IMF) and European central banks on controlled gold sales. However, other factors, including continued and substantial quantities of planned gold sales by major European central banks and a generally low investor confidence in gold mining since the Bre-X incident, compounded by growing attractions towards investment in the high-tech industry, will continue to cloud the future of gold. Nevertheless, the Asian recovery and growth of the key developing economies around the world will help strengthen the global economy and boost demand for minerals and metals. Under this scenario, metal prices, including those for gold, are expected to strengthen. This will have a positive effect on mine openings and closings in Canada in the foreseeable future. As indicated above, at least 10 mines are likely to open in 2000. With some 10 mines likely to close in the year, the overall mining scene in Canada will likely be more stable in 2000 than in 1999. Capital investment for mines to open in 2000 is expected to exceed $900 million, which is higher than the $850 million for 1999.

Notes: (1) Information in this review was current as of June 15, 2000. (2) This and other reviews, including previous editions, are available on the Internet at http://www.nrcan.gc.ca/mms/cmy/index_e.html.

Note to Readers

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TABLE 1. MINE OPENINGS AND CLOSINGS IN CANADA, 1999

Province/ Territory	New Mines			Mines Re-Opened			Mines Suspended			Mines Closed		
	Precious Metals	Base Metals	Other Minerals/ Metals	Precious Metals	Base Metals	Other Minerals/ Metals	Precious Metals	Base Metals	Other Minerals/ Metals	Precious Metals	Base Metals	Other Minerals/ Metals
Newfoundland	–	–	1	–	–	–	–	–	–	–	–	–
Nova Scotia	–	–	–	–	–	–	–	–	–	–	–	1
New Brunswick	–	–	–	–	–	–	–	–	–	–	1	–
Quebec	1	1	–	–	–	–	2	–	–	2	1	–
Ontario	–	–	1	1	–	–	4	–	–	2	3	–
Saskatchewan	–	–	2	–	–	–	–	–	–	–	–	2
British Columbia	–	–	–	–	2	–	1	2	–	1	–	–
Yukon	–	–	–	–	–	–	1	–	–	–	–	–
Northwest Territories	–	–	–	1	–	–	1	–	–	–	–	–
Canada, total by commodity group	1	1	4	2	2	–	9	2	–	5	5	3
Total Canada		6			4			11			13	

Source: Natural Resources Canada, based on company reports.
– Nil
Note: The above table includes the East Amphi open-pit gold mine in Quebec that opened in January and closed in August, and the Highland Valley Copper mine in British Columbia that suspended production in May and re-opened in August.

TABLE 2. MINE OPENINGS, RE-OPENINGS, EXPANSIONS, EXTENSIONS, SUSPENSIONS AND CLOSURES IN CANADA IN 1999

Mining Project	Location	Province/ Territory	Ore Capacity (tonnes/day)	Employment during Mine Life[1]	Date of Opening, Re-Opening, Expansion, Extension, Suspension or Closure	Mine or Plant Type	Main Commodities	Companies	Remarks
NEW OPERATIONS									
Precious Metals									
East Amphi	Malartic	Que.	800	30	January	O/P	Gold	McWatters Mining Inc.	The East Amphi open-pit gold operation began production in January 1999 and was completed in August of the same year, mining some 125 042 t of ore grading 5.53 g/t gold to produce some 21 563 oz of gold. McWatters Mining acquired the property in January 1998 for $3 million. In September 1999, a feasibility study revealed an underground mining plan to develop ore reserves at depth. The company believes that an underground mine could be brought into production in nine months once a production decision is made. The total capital cost of developing an underground mine is estimated at $10 million. The mining plan calls for an 800-t/d production rate that could be increased to 1000 t/d by adding additional trucking capacity. At a 97% mill recovery rate based on actual recovery of the open-pit ore, which was processed at the company's Sigma mill nearby, annual production would be about 60 000 oz of gold. The average cash operating cost is estimated at US$183/oz and the total cost at US$225/oz. The mine could support 50-60 mining jobs. As of September 29, 1999, total probable reserves stood at 1 124 600 t, or 183 000 oz, grading 5.07 g/t gold. In addition, there are more than 1 Mt of indicated resources (195 000 oz) grading 5.91 g/t gold and 2.7 Mt of inferred resources (461 000 oz) grading 5.2 g/t gold.
Base Metals									
Bell Allard	Matagami	Que.	2 000	250	January	U/G	Zinc, copper	Noranda Inc.	The mine began production in January 1999 and reached commercial production at 65% of its designed operating capacity of 2000 t/d in January 2000. It was brought on stream at an estimated capital cost of $133 million. Ore is processed at the company's concentrator at Matagami. At the start of production, ore reserves stood at 3.2 Mt grading 13.77% zinc, 1.5% copper, 48 g/t silver and 0.68 g/t gold. The mine life is estimated at five years. Planned annual zinc production is about 100 000 t. The mine was developed to replace the Isle Dieu and Norita East mines, which were closed in 1997. In late February 2000, operations at the mine were suspended due to a malfunction of the hoisting skip that caused damage to the shaft compartment. However, production had resumed in early April after successful repairs were made.

Other Minerals and Metals

Shabogamo	Smoky Mountain	Nfld.	375e	30e	July	O/P	Quartz (high purity)	Shabogamo Mining and Exploration Co. Ltd.	After successful bulk sampling and finalization of a supply contract in 1998, the mine was brought on stream in July 1999. Production is planned at 100 000 t/y of high-purity quartz and will supply SKW Canada Inc.'s ferroalloy plant at Bécancour, Quebec, for 10 years. As of July 1999, quartz reserves stood at 5 Mt. Shabogamo also has acquired the mineral rights to the old L M & E iron oxide stockpiles and deposits on both sides of the Quebec-Labrador border near Schefferville.
Kapuskasing	Kapuskasing	Ont.	3 500e	100	August	O/P	Phosphate	Agrium Inc.	Mining began at the Kapuskasing open-pit mine in Ontario in July 1999 with production start-up in August. It is Canada's first phosphate mine. The high-quality phosphate deposit was developed over two years (since September 1997) at a cost of US$70 million. At the start of production, ore reserves were estimated at 22 Mt grading 38% P_2O_5. The phosphate rock mined is processed at the company's Redwater, Alberta, plant, which was modified to process it into phosphate fertilizer. The high-grade, low-cost mine is expected to supply 100% of the phosphate rock required by the Redwater plant for approximately 20 years. The Redwater plant has an annual production capacity of 650 000 t of monoammonium phosphate (MAP). Procuring phosphate rock constitutes about 70% of the plant's production cost. The original Kapuskasing deposit was drilled in 1954 by Continental Copper as a base-metal project. The property was acquired by Agrium when it merged with Viridian Inc. in December 1996. Prior to the start of mining at Kapuskasing, Agrium relied, since 1986, on imported rock from Togo, Africa.
McArthur River	McArthur River	Sask.	125	450	December	U/G	Uranium	Cameco Corporation and COGEMA Resources Inc.	The McArthur River uranium mine came into production in early December 1999. Ore is processed at the Key Lake mill (located some 80 km southwest of the mine), which was revamped in June 1999 to handle blended ore grading 4% U_3O_8. Mine production is planned at 18 million lb/y U_3O_8 (6924 tU). Cameco Corporation owns a 69.805% controlling interest and is the mine's operator. COGEMA Resources Inc. owns the remaining 30.195%. The mine was developed at a capital cost of $400 million. It is the world's largest and highest-grade uranium deposit. As of December 31, 1999, its overall reserves and outlined resources stood at 186 000 tU with 98 000 tU currently in the mineable category. While the ore grade of ore reserves averages 14.7% U (17% U_3O_8), the resource grade averages 10.2% U (12.03% U_3O_8). There is significant potential to delineate additional reserves.

TABLE 2 (cont'd)

Mining Project	Location	Province/ Territory	Ore Capacity (tonnes/day)	Employment during Mine Life[1]	Date of Opening, Re-Opening, Expansion, Extension, Suspension or Closure	Mine or Plant Type	Main Commodities	Companies	Remarks
NEW OPERATIONS (cont'd)									
Other Minerals and Metals (cont'd)									
McClean Lake	McMahon Lake	Sask.	275[e]	200	June	O/P & U/G	Uranium	COGEMA Resources Inc., Denison Mines Limited and OURD (Canada) Co., Ltd.	Production began on June 22, 1999, by feeding stockpiled uranium ore from the JEB pit into the McClean Lake mill and the first barrel of yellow cake was produced on July 12. The mine was developed at a capital cost of $200 million. It is the first Canadian, French and Japanese mining joint venture in Canada in which COGEMA Resources Inc., the majority owner of the project, holds a 70% interest, Denison Mines Limited holds 22.5%, and OURD (Canada) Co., Ltd. holds 7.5%. The McClean Lake uranium deposit has an overall mineable reserve of 17 300 tU. The designed open pit runs from 20 to 145 m in depth. Currently, the overall ore grade averages 2.7%, with underground ore increasing to 4% at a depth of 170 m. The operation involves open-pit mining at the Sue A, B and C orebodies and underground mining at McClean. Production is planned at 6 million lb U_3O_8 (2308 tU) annually. The mill capacity may be expanded to mill Cigar Lake ore. The Cigar Lake mine is scheduled to come on stream in 2002.
RE-OPENINGS									
Precious Metals									
Hislop West	Matheson	Ont.	500	25	July	O/P	Gold	St. Andrew Goldfields Ltd.	Open-pit mining began in July 1999 and gold production commenced in August. The main source of ore came from the near-surface Hislop West Zone, which was outlined in early 1999. At the start of production, ore reserves stood at 325 000 t grading 3.4 g/t gold. Ore is processed at the company's Stock mill about 30 km west of the mine site. Gold production is estimated at 20 000 oz/y over less than two years at a cash cost of US$195/oz. The Hislop property hosted an underground mine, which operated between 1991 and 1994 and produced 35 200 oz of gold. The company hopes to use the cash flow from the current operation to re-open the Stock mine and to develop the nearby Taylor project.
Con	Yellowknife	N.W.T.	550	250	June	U/G	Gold	Miramar Mining Corporation	The mine re-opened in June 1999 after a year-long strike that began in May 1998. In December 1999, Miramar acquired the Giant gold mine (previously owned by the now-defunct Royal Oak Mines Inc.) at Yellowknife from the federal Department of Indian Affairs and Northern Development (DIAND) and announced that it will combine the Giant and Con operations to produce 130 000 oz/y of gold at a lower cash cost of US$260/oz, which is lower than the previous cost at the Giant and Con mines. Annual gold production from the Con mine is planned at 100 000 oz with the remaining 30 000 oz coming from Giant's higher-grade Supercrest Zone. In integrating the Con and

									Giant operations, ore mined from Giant will be trucked to the Con mill and processed in the flotation/autoclave circuits. As part of an agreement with the City of Yellowknife and the Government of the Northwest Territories (GNWT), Miramar will sell part of the Giant property to the City of Yellowknife, and DIAND and the GNWT will provide funding to a maximum of $500 000 per year for exploration at the Giant and Con properties.
Base Metals									
Highland Valley Copper[2]	Logan Lake	B.C.	125 000	1 064	August	O/P	Copper, molybdenum, gold	Cominco Ltd., Rio Algom Limited, Teck Corporation, and Highmont Mining Company	Production at the Highland Valley Copper mine, Canada's largest open-pit mining operation, was suspended on May 15, 1999, due to a labour dispute as a result of low copper prices. It re-opened in late August after an agreement was reached between the mine and the union that ties workers' pay to the price of copper. The mine reached its normal capacity in early October.
Myra Falls	Campbell River	B.C.	4 000	360	March	U/G	Zinc, copper	Boliden Limited	Production at the Myra Falls operation was suspended in December 1998 due to poor ground conditions that led to the dilution of ore and lower head grades. About four fifths of the work force remained on the job during the suspension. Satisfied with rehabilitation work and additional underground development, which cost just under $15 million, Boliden re-opened the mine for production in March 1999. At the start of resumption of production, ore reserves at the mine stood at 6 785 000 t grading 7.7% zinc, 1.5% copper, 0.4% lead, 35 g/t silver and 1.4 g/t gold. At full capacity, the mine is expected to produce 60 000 t of zinc, 20 000 t of copper, 32 000 oz of gold and 1 million oz of silver.
EXPANSIONS AND EXTENSIONS									
Precious Metals									
Doyon	Cadillac	Que.	3 500	453	1994-2000	U/G	Gold	Cambior inc.	Since its purchase of the remaining 50% interest in the Doyon mine that it did not already own from Barrick Gold Corporation in 1998, Cambior inc. has embarked on a cost reduction and reserve extension program. In 1999, the Doyon Division, which includes the Doyon and Mouska mines, produced a total of 242 800 oz of gold at an average cash cost (direct production costs) of US$203/oz, representing a 10% decrease in costs compared to 1998. However, there was a significant change in mining reserves at the Doyon mine, partly due to a revision in the mining plan and more conservative extraction parameters in certain sectors, particularly in the pillars located in the upper portion of the mine above level 8. The average grade of the proven and probable reserves above level 8 is 5.8 g/t gold, while the reserves below level 8 have a higher average grade of 6.7 g/t gold. The result was a shift of ore reserves categories. As of December 31, 1999, ore reserves at the Doyon Division stood at 10.623 Mt grading 6.3 g/t gold, with an additional 3.04 Mt grading 2.8 g/t gold in the measured and indicated categories and 7.94 Mt grading 4.8 g/t gold in the inferred category. Total contained gold in all categories amounted to 3.667 million oz, compared to 3.664 million oz in 1998. In 1999, capital investment in Doyon totaled US$4.4 million. This will be increased to US$11 million in 2000 to continue development of the production block on level 12 and to complete the internal shaft and lower levels at Mouska.

TABLE 2 (cont'd)

Mining Project	Location	Province/ Territory	Ore Capacity (tonnes/day)	Employment during Mine Life[1]	Date of Opening, Re-Opening, Expansion, Extension, Suspension or Closure	Mine or Plant Type	Main Commodities	Companies	Remarks
EXPANSIONS AND EXTENSIONS (cont'd)									
Precious Metals (cont'd)									
Kiena	Val-d'Or	Que.	1 700	195	1997-2002	U/G	Gold	McWatters Mining Inc.	Since acquiring the Kiena and Sigma mines from Placer Dome North America in September 1997, McWatters Mining Inc. has embarked on a US$23 million program to reduce costs, develop newly discovered deep ore zones, and extend the mine life at Kiena and at the Sigma-Lamaque complex. In 1999, the Kiena mine produced 86 602 oz of gold at a cash operating cost of US$212/oz, compared with 82 000 oz from the Sigma-Lamaque complex at a cash operating cost of US$243/oz. Total production from Kiena and Sigma-Lamaque is expected to rise to 250 000 oz/y of gold by 2002, and could reach 400 000 oz/y within three to four years (also see Sigma below).
LaRonde	Val-d'Or	Que.	3 265	296	1997-2004	U/G	Gold, zinc, copper, silver	Agnico-Eagle Mines Limited	Since the discovery of extensive gold-silver-copper-zinc mineralization at depth, the company embarked on a shaft-sinking (Shaft No. 3) and capacity expansion program to increase production. In its Phase I expansion program, which started in 1997, the mine's ore capacity was increased from the original 1800 t/d to 3265 t/d in 1999, with production reaching the capacity level in the first quarter of 2000. However, higher-than-expected ore thicknesses in zones accessible from Shaft No. 3 forced the company to plan a further expansion. A revised Phase II capital program was designed in 1999 to increase the ore capacity to 4535 t/d. Although the revised plan will require an extra US$34 million, which will increase the total capital cost of the two-phase expansion program to US$218 million, the expansion is expected to result in a greater rate of return and a shorter payback period. About US$120 million of the US$218 million remains to be spent over the next 3.5 years. An expansion of the mill capacity to 4535 t/d is expected to be completed by the fourth quarter of 2000. At this rate, LaRonde's annual gold production is expected to triple, to 337 000 oz, in 2004 at a cash operating cost of US$104 per oz, making the mine one of the lowest-cost gold mines in the world. Current mine reserves stand at 3 million oz, with an additional 3.1 million oz in the mineral resource category. As major ore zones are open at depth, there is good potential to further increase ore reserves.

Sigma	Val-d'Or	Que.	2 000	300e	1997-2002	O/P and U/G	Gold	McWatters Mining Inc.	The company acquired the Sigma, Lamaque and Kiena gold mines from Placer Dome North America in September 1997. The Sigma-Lamaque complex consists of the Sigma No. 1 underground mine and the Sigma No. 2 and No. 3 open-pit mines. Since the acquisition, the company has embarked on a US$23 million cost-cutting, mine-life extension program at both Sigma and Kiena. New resources added include the Sigma 2000 discovery. In February 1999, the main mining activity at Sigma was suspended at the underground operation for an anticipated five-month period due to high costs and low gold prices. About 179 of the complex's 250 employees were laid off. However, selective mining of previously developed high-grade zones underground continued and were proven to be low cost at below US$200/oz. As well, a $5 million near-surface exploration program in the fall of 1999 has resulted in boosting the near-surface reserves at Sigma-Lamaque to 16.3 Mt grading 3.02 g/t gold, or 1.6 million oz, in the first quarter of 2000. In the measured and indicated resource category, an additional 12.5 Mt grading 1.18 g/t gold lies near the surface. Another 33 Mt of mineralized material has been identified along extensions of existing ore zones. This new reserve base, mostly near Sigma, is in stark contrast to the year-end 1999 surface reserves of 3.8 Mt grading 3.28 g/t gold at Sigma-Lamaque. In preparation for increased production from the open pits, McWatters is spending $1.9 million to expand the Sigma mill capacity to 3000 t/d from the current 2000 t/d by July 2000. Another $2 million has been budgeted to further expand the mill capacity to 4000 t/d by the second quarter of 2001 to accommodate 3600 t/d of ore from open pits at Sigma-Lamaque and 400 t/d from underground at Sigma. The company is contemplating an ultimate goal of 7000 t/d of mill capacity. In the fourth quarter of 1999, the Sigma-Lamaque complex produced 19 420 oz of gold at a cash operating cost of US$207/oz, compared with 20 153 oz at a cost of US$330/oz during the same period in 1998. As a result of the mill expansion, gold production from the complex is expected to reach 155 000 oz in 2001 from 82 000 oz in 1999. Cash operating costs are expected to drop to US$180/oz in 2002 from US$243/oz in 1999.
Campbell	Balmertown	Ont.	1 540	365	1997-1999	U/G	Gold	Placer Dome North America	In 1999, the US$51 million depth development project for the 1820-m-deep circular shaft (Reid shaft) at the Campbell mine was completed and the shaft was commissioned. The new Reid shaft provides a second, more efficient underground access and allows for exploration drilling to greater depths. A significant part of the mine property remains to be explored and a number of existing zones are likely to be expanded. In 1999, the mine produced 262 015 oz of gold, a decrease of 14% from 1998 due to lower head grades. The average cash production cost was US$165/oz, 22% higher than a year before, due to higher milling costs and the commissioning of the new Reid shaft. Ore reserves as of December 31, 1999, were 4.044 Mt grading 14.5 g/t of gold (or 1.89 million oz), sufficient to support 7.6 years of production at the current rate.

TABLE 2 (cont'd)

Mining Project	Location	Province/ Territory	Ore Capacity	Employment during Mine Life[1]	Date of Opening, Re-Opening, Expansion, Extension, Suspension or Closure	Mine or Plant Type	Main Commodities	Companies	Remarks
			(tonnes/day)						
EXPANSIONS AND EXTENSIONS (cont'd)									
Precious Metals (cont'd)									
Lac des Îles	Thunder Bay	Ont.	2 650	128	1998-2001	O/P	Palladium, platinum group metals, nickel, copper, gold	North American Palladium Ltd.	Exploration successes in and around the Roby and Twilight zones since 1998 have encouraged the company to embark on a major mine expansion program at Lac des Îles. The program will see the mill capacity increase to 15 000 t/d from the current 2400 t/d. Ore feed will be supplied from the enlarged pit, which hosts proven and probable ore reserves of 74.2 Mt grading 1.64 g/t palladium, 0.18 g/t platinum, 0.14 g/t gold, 0.07% copper and 0.06% nickel, based on a cutoff grade of 0.92% palladium-equivalent. Commissioning of the new capacity is expected to occur in mid-2001. When completed, the mine-site work force is expected to increase to 250 from the current 128. The mine life is estimated to be 11 years. The expansion is expected to more than triple annual production to 248 900 oz of palladium (5% of the world's annual palladium supply), 24 200 oz of platinum and 19 100 oz gold, plus copper, nickel and cobalt credits by 2002. Cash production costs over the mine life are pegged at US$131/oz, net of by-product credits but excluding royalties. The total capital cost of the planned expansion is estimated at US$126.5 million. This capital investment has a planned payback of about 2.5 years and an after-tax internal rate of return of 26.6%. In early April 2000, the company received a US$90 million loan from three Canadian banks for the expansion. The company plans to finance the remainder through equity. Kaiser-Francis Oil, which owns 17.4% of North American Palladium Ltd. and is the company's largest shareholder, has agreed to cover any cost overrun during development. The Sheridan Platinum Group holds a 16.8% interest in the company. The mine is Canada's only primary producer of palladium.
Bissett	Winnipeg	Man.	635	155	1999-2000	U/G	Gold	Harmony Gold Mining Company Limited	In September 1999, the company launched a $6 million capital expansion program at the Bissett gold mine in eastern Manitoba to increase production and to cut costs. Under the expansion plan, the mill capacity will be increased from 635 t/d to 900 t/d with the average cash cost dropping to US$220/oz from US$278/oz prior to the expansion in 1999. The expansion will create 40 new jobs, increasing the total work force at the mine to 195. Some of the expansion budget will also be used for another round of delineation drilling and for additional trackless equipment for operations below the present 32 level. The mine was closed in December 1997 when Rea Gold Corporation, the mine's previous owner, declared bankruptcy. Harmony Gold Mining Company Limited, a South African-controlled company, purchased the mine in the spring of 1998 and re-opened it in June 1998. At the start of 1999, ore reserves were estimated at 2 Mt grading 8 g/t gold. Production is planned at 60 000 oz of gold annually.

Seabee	La Ronge	Sask.	650	140	1998-1999	U/G	Gold	Claude Resources Inc.	In 1999, the mine produced 54 100 oz of gold at a total cash cost of US$193/oz. Considerable development occurred on the Currie Rose property immediately west of the mine between the 110 and 290-m levels. Claude Resources Inc. now owns 100% of the Currie Rose property subject to a 30% net profits interest payable to Currie Rose Resources Inc. after pay-out of development and exploration expenditures incurred by Claude Resources Inc. to bring the property into production. The Currie Rose project was brought on stream in early 1999 at a mining rate of 30 000 t/y of ore. The mined ore is treated at Seabee. The addition of Currie Rose boosted the total ore reserves at Seabee. As of March 2000, the combined ore reserves amounted to 507 000 t averaging 8.56 g/t gold, with an additional 346 000 t in the possible category. Exploration has also identified a resource potential of 1.5 Mt on the Seabee/Currie Rose property. New high-grade mineralization encountered during underground development on the Currie Rose property has been particularly encouraging.
Base Metals									
Niobec	Chicoutimi	Que.	2 250		1998-2001(?)	U/G	Ferroniobium	Teck Corporation and Cambior inc.	In 1998, the partners launched a $15.7 million capital program to deepen the mine shaft, to develop ore reserves in the lower or third block (which contains 7 Mt grading 0.73% Nb_2O_5), to develop a ramp, and to install a new crusher at the Niobec underground mine. With the addition of these new reserves, total mine reserves now stand at 10.6 Mt grading 0.52% Nb_2O_5, sufficient to sustain the current production rate until the mid-2010s. A positive feasibility study, completed in the third quarter of 1999, supported the expansion of mine production to capture the rising market for niobium. Initial production from the Phase I expansion is expected to begin in the fourth quarter of 2000. The project will slowly ramp up, increasing capacity by 20% as the market warrants. A second-phase expansion, to begin at an unspecified date, will increase output by another 20%. Capital costs for the first phase will be $4.7 million and for the second phase, less than $2 million. Production in 2000 is expected to total 2400 t of contained niobium, up from 2300 t in 1999 and 2177 t in 1998.
Creighton	Sudbury	Ont.	3 500[e]	525	1998-2001 (Phase 1) 2001-2005 (Phase 2)	U/G	Nickel, copper, cobalt, precious metals	Inco Limited	A US$125 million, two-phase mine expansion program for the Creighton mine in Sudbury, as announced in April 1998, continued in 1999. The program aims to develop a 6-Mt high-grade, low-cost nickel-copper deposit at the Creighton mine over the next two decades. The first phase, currently under way, will develop proven reserves of 2.8 Mt grading 3.45% nickel and 2.97% copper located between the 7400 and 7660 levels. Production from this ore is expected to begin in 2001 and continue through 2013. In 1999, the total capital costs incurred on the project amounted to US$12 million. The second phase involves the development of 3.1 Mt of probable reserves grading 3.62% nickel and 3.25% copper. This ore, situated between the 7660 and 8180 levels, is expected to be mined between 2005 and 2019. In contrast, the current average grades of the Ontario Division mines are 1.3% nickel and 1.2% copper. When in full production, this Creighton Deep project is expected to produce 10 900 t of nickel, 9500 t of copper and 28 000 oz of platinum group metals annually.

TABLE 2 (cont'd)

Mining Project	Location	Province/ Territory	Ore Capacity (tonnes/day)	Employment during Mine Life[1]	Date of Opening, Re-Opening, Expansion, Extension, Suspension or Closure	Mine or Plant Type	Main Commodities	Companies	Remarks
EXPANSIONS AND EXTENSIONS (cont'd)									
Base Metals (cont'd)									
McCreedy East	Sudbury	Ont.	2 700	180	1996-1999	U/G	Nickel, copper, cobalt, precious metals	Inco Limited	A $194 million capital program to fully develop the mine and to expand ore production capacity since its opening in 1996 was completed in 1999. By the end of 1999, daily ore capacity had reached the 2700-t level. Inco has designated McCreedy East as one of four key mines in its Ontario Division. The other three, Creighton, Copper Cliff North and Copper Cliff South, are all in the Sudbury area. When in full production, McCreedy East could produce some 14 500 t/y (32 million lb) of nickel and will be one of the lowest-cost nickel-copper producers in the company's Ontario Division.
SUSPENSIONS									
Precious Metals									
Francoeur	Rouyn-Noranda	Que.	400	90	September 25	U/G	Gold	Richmont Mines Inc.	Production was suspended on September 25, 1999, due to low gold prices and high costs. During the suspension, the mining method was changed to the long-hole method from the more expensive room-and-pillar method; production at the mine resumed in February 2000.
Joe Mann	Chibougamau	Que.	1 360	140	September	U/G	Gold, copper	Campbell Resources Inc.	Production was suspended in September 1999 due to low gold prices, high costs and poor ground conditions that led to excessive dilution of ore grades. The mine re-opened in April 2000. During a six-month suspension, the mining method was changed to the less expensive cut-and-fill method from shrinkage and long-hole mining methods. In 1999, the mine produced 51 300 oz of gold at a cash operating cost of US$292/oz as well as 1.065 million lb of copper. Gold production in the nine operating months of 2000 is forecast to be 83 500 oz at a cash cost of US$225/oz, increasing to 90 000 oz in 2001. In 1999, total capital development costs of shaft deepening and a change in the mining method at Joe Mann amounted to $1.2 million. Capital development costs for 2000 are estimated at $3.6 million.
Macassa	Kirkland Lake	Ont.	1 100	160	June 14	U/G	Gold	Kinross Gold Corporation	Production was suspended in June 1999 due to low gold prices.
Madsen	Red Lake	Ont.	500	80[e]	June 17	U/G	Gold	Claude Resources Inc.	Production was suspended in June 1999 due to low gold prices, high costs and lower ore grades of previously outlined ore reserves. Exploration is under way to define higher-grade zones such as the No. 8 Zone.

Nighthawk	Timmins	Ont.	815	(see Pamour)	September	U/G	Gold	Kinross Gold Corporation	The mine was closed in September 1999 by previous owner Royal Oak Mines Inc. due to financial difficulties that forced the company into receivership in April 1999. On December 24, 1999, Kinross Gold Corporation purchased the Timmins assets of Royal Oak, which included the Nighthawk mine, for US$5 million (also see Pamour below).
Pamour	Timmins	Ont.	2 720	265	September	O/P & U/G	Gold	Kinross Gold Corporation	The mine was closed in September 1999 by previous owner Royal Oak Mines Inc., due to financial difficulties, which forced the company into receivership in April 1999. On December 24, 1999, Kinross Gold Corporation purchased the Timmins assets of Royal Oak, which included the Pamour mine, for US$5 million (also see Nighthawk above).
Blackdome	Clinton	B.C.	180	50	May	U/G	Gold	Claimstaker Resources Ltd. and Jipangu Inc.	Production was suspended in May 1999 due to low gold prices. The mine was first brought on stream by Blackdome Mining Corporation in May 1986. Mining was suspended in December 1990. The mine was re-opened in October 1998 by the present owners with Claimstaker being the operator.
Mount Nansen	Carmack	Yukon	700	50	February 17	O/P	Gold	B.Y.G. Natural Resources Inc.	Production at the Mount Nansen gold mine was suspended in February 1999 in response to directions from the Water Resources Branch of DIAND. At the time of suspension, ore was nearly exhausted at the producing orebody. As well, the company was conducting exploration on the breccia pipe and Flex Zone while awaiting renewal of the water licence to continue mining and milling until the company went into receivership in March 1999.
Giant	Yellowknife	N.W.T.	1 000	260	September	U/G	Gold	Miramar Mining Corporation	Production at the Giant gold mine was suspended on October 5, 1999, to meet a condition of sale of the mine to Miramar Mining Corporation. The transaction was completed in December 1999. The mine was previously owned by Royal Oak Mines Inc., which became insolvent in April 1999. Miramar has since redeveloped the mine for production in February 2000 at a reduced ore production rate of 275 t/d to complement production from its nearby Con mine. Currently, production at the Giant mine comes mainly from the Supercrest Zone. Ore is processed at the Con mill as the Giant mill was mothballed. Gold production from the zone is expected to be 30 000 oz/y over the next 30 months, during which time the company will examine other potential areas for possible development. The combined Con and Giant production over the next three years is planned at 130 000 oz of gold annually.
Base Metals									
Gibraltar	McLeese Lake	B.C.	37 650	287	February 28	O/P & leaching	Copper, molybdenum	Taseko Mines Limited	Production at the Gibraltar copper mine was suspended by its former owner, Boliden Limited, in February 1999 due to low copper prices. In April 1999, Taseko Mines Limited acquired the mine from Boliden and has since kept it on care and maintenance awaiting better and more stable copper prices to re-open the mine.

TABLE 2 (cont'd)

Mining Project	Location	Province/ Territory	Ore Capacity (tonnes/day)	Employment during Mine Life[1]	Date of Opening, Re-Opening, Expansion, Extension, Suspension or Closure	Mine or Plant Type	Main Commodities	Companies	Remarks
SUSPENSIONS (cont'd)									
Base Metals (cont'd)									
Highland Valley Copper [2]	Logan Lake	B.C.	125 000	1046	May 15	O/P	Copper, molybdenum, gold	Cominco Ltd., Rio Algom Limited, Teck Corporation, and Highmont Mining Company	Operations were suspended in May 1999 due to a labour dispute. The mine re-opened in late August and commercial production resumed in October. It is the largest copper mine in Canada.
CLOSURES									
Precious Metals									
East Amphi	Malartic	Que.	800	30	August	O/P	Gold	McWatters Mining Inc.	The mine closed in August due to the depletion of open-pit ore reserves. Production began in January 1999. The company has yet to decide on whether to develop an underground mine on site, depending on the outlook for gold.
Joubi	Val-d'Or	Que.	100	45	October 31	U/G	Gold	Western Quebec Mines Inc.	The mine closed in October 1999 due to the depletion of ore reserves. Production began in October 1989.
Lakeshore tailings	Kirkland Lake	Ont.	1 360	50	June 14	Tailings	Gold	Kinross Gold Corporation	Production ceased in June 1999 due to low gold prices rendering the remaining reserves uneconomical. At the time of closure, only about four months of tailing material remained.
Detour Lake	Matheson	Ont.	3 500	240	June 15	U/G	Gold	Placer Dome North America	The mine closed in June 1999 due to the depletion of ore reserves. Production began in August 1983.
Snip	Stewart	B.C.	475	180	May	U/G	Gold	Homestake Canada Inc.	The mine closed in May 1999 due to the depletion of ore reserves. Production began in January 1991.
Base Metals									
Heath Steele	Newcastle	N.B.	3 200	303	September 30	U/G	Zinc, copper, lead, silver	Noranda Inc.	The mine closed at the end of September 1999 due to the exhaustion of economically mineable ore. Production first began in 1957.
Mines Gaspé	Gaspé	Que.	5 500	630	October 14	U/G	Copper	Noranda Inc.	Copper operations at the Mines Gaspé mine ceased in October 1999 due to the depletion of economically mineable ore. Production first began in 1955. During the course of 45 years, several mines were developed at this mining division including, notably, the Needle Mountain and Copper Mountain open-pit and underground mines. A low-grade copper-mineralized material stockpile remains but it is uneconomical at current copper prices.

Levack	Sudbury	Ont.	3 600e	100e	July	U/G	Nickel, copper, cobalt, platinum group metals, gold, silver	Inco Limited	The mine closed in July 1999 due to the depletion of economically mineable ore.
McCreedy West	Sudbury	Ont.	2 000	100	July	U/G	Nickel, copper, cobalt, platinum group metals, gold, silver	Inco Limited	The mine closed in July 1999 due to the depletion of economically mineable ore. Production began in 1974.
Little Stobie	Sudbury	Ont.	3 400e	106	August	U/G	Nickel, copper, cobalt, platinum group metals, gold, silver	Inco Limited	The mine closed in August 1999 due to ore depletion. Production began in January 1971.
Other Minerals									
Phalen	New Waterford	N.S.	6 000e	433	December 19	U/G	Coal	Cape Breton Development Corporation (CBDC)	The mine closed due to high costs and irreparable damage as a result of underground roof caving and water leakage problems. Production began in 1967. CBDC, which is 100%-owned by the Canadian government, also owns and operates the nearby Prince Colliery. Privatization of the company is currently being considered.
Horseshoe Lake	Ormiston	Sask.	n.a.	n.a.	January 31	Surface, brine	Sodium sulphate	Ormiston Mining and Smelting Co. Ltd.	Production at the Horseshoe Lake sodium sulphate brining operation ceased in January 1999 due to the depletion of brine reserves.
Key Lake	Key Lake	Sask.	630	316	June	O/P	Uranium	Cameco Corporation	Mining ceased at the Key Lake uranium mine in April 1997. However, the mill continued to process stockpiled mine ore until June 1999. Since November 1999, the mill has been processing high-grade uranium ore from the McArthur River mine, which began production in December. The McArthur River mine is the world's largest, high-grade uranium deposit. Mining first began at the Key Lake mine in August 1981.

Source: Natural Resources Canada, based on company reports and communications with companies.
e Estimated; O/P Open pit; U/G Underground; t Metric tonne.
1 Employment refers to workers on the company's payroll and to contract workers at an operation, or at an operation prior to its closure. 2 Mine closed and re-opened in 1999.
Note: A mine that closed and re-opened in the same year is shown under both categories.

TABLE 3. NEW PRODUCTION FROM MINE OPENINGS IN CANADA IN 1999

Mining Project	Main Commodities	Estimated Annual Production[1]						
		Gold (g)	Gold (oz)	Silver (g)	Silver (oz)	Copper (t)	Zinc (t)	Other Minerals/Metals
NEW OPERATIONS								
Precious Metals								
East Amphi open pit	Gold	653 000	21 000			–	–	–
Base Metals								
Bell Allard	Zinc, copper	–	–			9 000	100 000	–
Other Minerals/Metals								
Shabogamo	Silica	–	–			–	–	100 000 t silica
Kapuskasing	Phosphate	–	–			–	–	1 100 000 t phosphate rock
McArthur River	Uranium	–	–			–	–	18 000 000 lb U_3O_8
McClean Lake	Uranium	–	–			–	–	6 000 000 lb U_3O_8
RE-OPENINGS								
Precious Metals								
Hislop West	Gold	622 000	20 000			–	–	–
Con	Gold	3 110 000	100 000			–	–	–
Base Metals								
Myra Falls	Zinc, copper, gold, silver	995 300	32 000	31 103 000	1 000 000	20 000	60 000	–
Planned total		5 380 300	173 000	31 103 000	1 000 000	29 000	160 000	100 000 t silica 1 100 000 t phosphate rock 24 000 000 lb U_3O_8

Source: Natural Resources Canada, based on company reports and communications with companies.
– Nil.
Note: Production was suspended at the Highland Valley Copper operation on May 15, 1999. However, it resumed production at the end of August in the same year and, therefore, is not included in the above table.

TABLE 4. NEW ORE RESERVES FROM MINE OPENINGS IN CANADA IN 1999

Mining Project	Main Commodities	Proven-Probable Ore Reserves[1]		In-Situ Metal Reserves							
		Tonnage	Grade	Gold	Gold	Silver	Silver	Copper	Zinc	Lead	Other Minerals
		(tonnes)		(g)	(oz)	(g)	(oz)	(t)	(t)	(t)	(t)
NEW OPERATIONS											
Precious Metals											
East Amphi open pit [1]	Gold	125 042	5.53 g/t gold	691 400	22 230	–	–	–	–	–	–
Base Metals											
Bell Allard	Zinc, copper	3 200 000	13.77% zinc 1.5% copper 0.68 g/t gold 48 g/t silver	2 174 100	69 900	153 588 900	4 938 000	48 000	440 600	–	–
Other Minerals											
Shabogamo	Silica	5 000 000	Silica	–	–	–	–	–	–	–	5 Mt silica
Kapuskasing	Phosphate rock	22 000 000	38% P_2O_5	–	–	–	–	–	–	–	8.36 Mt P_2O_5
McArthur River	Uranium	186 000 tU									186 000 tU
McClean Lake	Uranium	17 300 tU		–	–	–	–	–	–	–	17 300 tU
RE-OPENINGS											
Precious Metals											
Hislop West	Gold	325 000	3.4 g/t gold	1 105 000	35520	–	–	–	–	–	–
Con	Gold	1 110 156	11.726 g/t gold	13 029 100	418800	–	–	–	–	–	–
Base Metals											
Myra Falls	Zinc, copper, lead, silver, gold	6 785 000	7.7% zinc 1.5% copper 0.4% lead 1.4 g/t gold 35 g/t silver	9 499 000	305 400	237 475 000	7 635 000	101 700	522 400	27 000	–
Total				26 495 600	851 850	391 063 900	12 573 000	149 700	963 000	27 000	5 Mt silica 8.36 Mt P_2O_5 203 300 tU

Source: Natural Resources Canada, based on company reports and communications with companies.
– Nil.
1 The East Amphi open-pit gold mine was opened and closed during 1999. As its open-pit ore reserves lasted only for eight months of production, the mine has no impact on Canada's gold reserves beyond 1999. Although the Highland Valley Copper operation closed in May 1999, it re-opened three months later. There was no impact on Canada's copper reserves on a year-end reporting basis. Therefore, the mine is not included in the above table.

International Scene

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INTRODUCTION

The year 1999, while not as painful as 1998, was not an easy one for Canada's minerals and metals industry. The first half of the year saw prices for many commodities fall, with negative effects felt by the industry throughout the world, although prices did improve somewhat in the second half. Exploration also suffered, dropping some 23% to US$2.7 billion; junior companies in particular found it difficult to raise funds. As in past years, South America led the way in attracting exploration.

Among other trends in 1999, a number of countries renewed their efforts, such as revising mining codes and investment policies, to attract foreign investment in their minerals sectors. A number continued to privatize their mining industry, for example, Zambia (copper) and Venezuela (aluminum), although these efforts were hampered by low commodity prices. In the face of low commodity prices, the industry showed increasing interest in restructuring and consolidation in a number of commodity sectors, such as aluminum, copper and coal – something that is expected to continue in 2000.

Both governments and industry increasingly recognized the need to address the three components of sustainable development – economic, environmental and social – as part of their policies and business plans. Some of the significant multilateral events, which are described in more detail later, were:

- A tripartite meeting on Social and Labour Issues in Small-Scale Mines held under the aegis of the International Labour Organization (ILO);
- A Round Table on Mining and the Environment, sponsored by the United Nations Department of Economic and Social Affairs and Germany; and
- A Workshop on Sustainable Development held by the three international nonferrous metals study groups.

The minerals and metals industry continued its efforts to adopt sustainable development approaches, not only for the environment but also with respect to social programs and community involvement:

- The Minerals Council of Australia continued to update its Code for Environmental Management through a substantial review process involving several months of stakeholder consultation. The revised code, which recognizes the need to address the "triple bottom line," is expected to be released in early 2000.
- Five companies (BHP, Pasminco, Placer Dome, Rio Tinto and WMC) formed the World Alliance for Community Health (web site http://www.wacommunityhealth.org), a private-sector initiative to develop and implement community health projects in cooperation with the World Health Organization (WHO). The World Alliance works with private-sector, government and non-government partners to plan and implement long-term community health projects in developing under-serviced areas. It assists member companies identify priority needs, design cost-effective projects, develop project standards, and access international expertise. The first projects are expected to be approved in early 2000.
- Companies continued to develop corporate codes of conduct and improve their environmental reporting. Some non-governmental organizations, too, have started to develop and promote their own codes of conduct for the mining industry. Furthermore, there is increasing pressure from a number of these groups for external auditing of corporate performance. In 1999, Placer Dome was the subject of two such audits: a report by the Mineral Policy Centre on Placer's Sustainability

Policy, and the CSIRO's report on Placer Dome Asia Pacific's implementation of the MCA's Code for Environmental Management. The Mineral Policy Centre's report noted that the most difficult aspect of social and environmental reporting for the mining industry is how to measure achievement against explicit goals.

As in previous years, environmental and health-based government regulations affecting the use of and trade in minerals and metals and their products continued to be of concern to the world's minerals and metals sector. These regulations have the potential to affect market access for these commodities and products, not only in Europe but also in countries that are traditional manufacturers of such products, such as Japan. In international fora, Canada continued to promote its Safe Use Principle, which is a risk-based approach to managing environmental and health concerns associated with minerals and metals production, use, recycling and disposal.

This review covers major international issues of importance to the Canadian minerals and metals sector, including multilateral, regional and bilateral developments during 1999.

MULTILATERAL DEVELOPMENTS

The OECD and Chemicals Issues

In June, the Joint Meeting of the Chemicals Committee and the Working Party on Chemicals reviewed recommendations from the Workshop on Nickel-Cadmium (Ni-Cd) Battery Recycling that was held in Mexico City in December 1998. Countries supported recommendations to have a web site on Ni-Cd batteries and an ad hoc group to improve recycling rate calculations. Countries also recommended that industry representatives meet with the Working Group on Waste Management Policy to explain existing barriers to the transboundary movement of spent Ni-Cd batteries and possible ways to remove or lower the barriers. Canada and most other countries also supported the adoption of a proposed harmonized label for Ni-Cd batteries that includes both the mobius loop and crossed-out trash container symbols. Because some members required additional time for national consultation, final adoption of the label was postponed until the next meeting in 2000.

Basel Convention on the Transboundary Movements of Hazardous Wastes and Their Disposal

The intent of the Basel Convention, which came into force in May 1992 and has been ratified by more than 100 countries, was to restrict the transboundary movement of hazardous wastes in order to protect those countries, particularly developing countries, that might not have the capacity or technology to handle them in an environmentally sound manner. The Convention defines recycling as a "disposal" activity, and recyclable materials as "wastes." Canada and some other governments have expressed concerns that the Convention does not adequately distinguish between recyclable materials destined for recovery operations and hazardous wastes destined for final disposal.

The fourth Conference of the Parties (CoP) was held in February 1998. Delegations agreed to amend the Basel Convention to add two new annexes. The first annex (Annex VIII) comprises a list of hazardous wastes that will become subject to the movement "ban" agreed to at CoP3, if and when it enters into force. The second annex (Annex IX) comprises a list of materials that are generally considered not hazardous and that will be excluded from the scope of the regulatory framework established by the Convention. Most recyclable metals are included on the second, non-hazardous annex list. The delegations further agreed to extend the mandate of the Technical Working Group to formally establish a "review mechanism" to revise and update the new annexes as may be required.

Delegations also reviewed requests submitted by Monaco, Israel and Slovenia to accede to Annex VII. These requests stem from the desire of these countries to be able to continue to receive hazardous recyclable materials from OECD member countries. However, the delegations at CoP4 rejected all accession requests, preferring to defer them until the movement ban has entered into force. The delegations further refused to agree to the development of technical criteria that could assist countries in a self-evaluation of their hazardous waste management capacities. However, it was agreed at CoP4 to provide Parties with an analysis that would highlight issues related to Annex VII. A set of terms of reference for this analysis was agreed to at CoP5. Concerns were expressed at the Technical Working Group (TWG) in April 2000 about delays, lack of funds, and the use of an elaboration paper prepared by the secretariat. After some discussion it was decided to move ahead on the analysis using the terms of reference developed at CoP5.

Law of the Sea Convention: Seabed Mining Code

The International Seabed Authority, an organization affiliated with the United Nations, was established in 1994 under the Convention and the associated Agreement of 1994 relating to the Implementation of Part XI (seabed provisions) of that Convention. A further step towards conclusion of the first mining code for the world's oceans was taken at the fifth session of the International Seabed Authority, which met in Kingston in August 1999.

The Council of the Authority completed a first reading of the code and embarked on a second reading as it continued the process of devising regulations to govern exploration for polymetallic nodules in the international seabed area. The text sets out the framework for the exploration regime, while the annexes contain a model contract and standard clauses. Once the Council has adopted the regulations, they will be applied through a series of 15-year contracts between the Authority and the private and public investors whose plans of work it has approved. The first seven of these, known as "pioneer investors," had their plans approved in 1997.

The regulations specify how the Authority will oversee prospecting and exploration by contractors. They spell out financial and technical requirements that contractors must meet, offer guarantees of security of tenure and confidentiality of proprietary information, and require contractors to establish training programs for personnel of the Authority and developing countries. The Authority would inspect operations and have the right to impose penalties for certain violations. Contractors would be obliged to implement measures to ensure the effective protection of the marine environment.

The Council adopted a nearly complete set of rules for its Legal and Technical Commission, the body that assists in the Authority's duty to organize and control activities in the seabed area beyond the limits of national jurisdiction. A decision on two pending rules on conditions under which states may take part in meetings of that expert body was put off to next year.

A common thread emerged in the parallel discussions on the mining code and rules for the Legal and Technical Commission. On the one hand is the wish of coastal and other states, wary of damage caused by environmental disasters on the high seas, to see that the Authority is legally equipped to deal with any adverse environmental effects of future seabed activities. On the other hand, states with a special interest in carrying out mining once it becomes economically viable want to ensure that investors are not hobbled by excessive regulation. They also seek assurance that data of commercial value given to the Authority will be kept confidential. Deep-sea mining is unlikely to become commercially viable in the near future.

In addition, the Assembly scheduled a two-part session for next year to enable the Council to complete its work on the draft mining code during 2000. The meetings are scheduled for two weeks each in March and July.

Persistent Organic Pollutants (POPs)

POPs are predominantly man-made toxic chemicals that, to varying degrees, resist photolytic, biological and chemical degradation. They are characterized by low water/high lipid solubility, which leads to their accumulation in fatty tissues, and are semi-volatile, being able to travel long distances in air. The 12 POPs under debate are: aldrin, chlordane, DDT, dieldrin, endrin, heptachlor, hexachlorobenzene, mirex, polychlorinated biphenyls (PCBs), toxaphene, and dioxins and furans. The "dirty dozen" fall into three categories: pesticides, industrial chemicals, and unintended by-products of combustion and industrial processes. Canada has played, or is playing, an active role in the POPs initiatives.

In 1999, the second and third rounds of talks focussed on a global treaty to reduce and eliminate environmental emissions and discharges of POPs. These talks examined provisions to reduce and/or eliminate emissions, production and uses of the POPs in the initial list identified for action under the UNEP mandate and how to ensure that all countries can successfully implement the provisions.

The third round of talks, formally known as the Third Session of the Intergovernmental Negotiating Committee (INC-3) for an International Legally Binding Instrument for Implementing International Action on Certain Persistent Organic Pollutants, was held in September 1999 in Geneva. The talks were attended by 115 countries, 17 intergovernmental organizations and 72 non-governmental organizations.

At the talks, negotiators reached agreement on proposals favouring the elimination of the 10 intentionally produced POPs. At the same time, the negotiators also recognized the public health need for an exemption for DDT, which is used in controlling vector-borne diseases such as malaria. These proposals went to participating countries for consultation and then for consideration at the fourth round of negotiations set for March 2000 in Bonn.

Three of the 12 POPs in the UNEP mandate are slated for elimination with no exemptions. These are the pesticides aldrin, endrin and toxaphene. Another five POPs are set for elimination with limited country-specific exemptions. They are the pesticides chlordane, dieldrin, heptachlor, mirex, and hexachlorobenzene, which is also an industrial compound and a by-product. With the exception of the exemptions, elimination would take place once the treaty enters into force.

While the production and use of DDT would be limited to control of vectors, such as mosquitos transmitting malaria, for public health purposes, all other uses including in agriculture would be prohibited.

New uses and production of polychlorinated biphenyls (PCBs) would be prohibited under policy proposals developed by the negotiators. Discussion focussed on the issue of PCBs already in use,

principally in electrical equipment, and the related complexity of identifying existing applications and dealing with replacement costs, particularly in developing countries.

There was agreement on a procedure for adding chemicals to the Convention. With the exception of a few remaining issues, the meeting also agreed on scientific criteria and data requirements for screening and evaluation.

The talks moved towards a consensus on the unintentionally produced by-products dioxins and furans. They also laid the groundwork for further consideration of proposals to advance technical and financial assistance, particularly for developing countries and countries with economies in transition, to enable implementation of the treaty.

International Labour Organization (ILO)

A tripartite meeting on Social and Labour Issues in Small-Scale Mines took place in Geneva May 17-21, 1999, under the auspices of the ILO's Sectoral Activities Program. The meeting examined issues related to occupational safety and health, women's participation, and child labour in relation to small-scale mining. It called for governments to establish appropriate legal and regulatory frameworks, supported the *ILO Declaration on Fundamental Principles and Rights at Work*, and identified the need for improved information and technical assistance for small mines. The meeting also called for increased dialogue on small-scale mining, implementation of relevant ILO conventions, and support for a range of social and economic measures to improve working conditions in small mines.

Over the years, the ILO has examined various labour issues related to the mining industry, including adopting a Convention (176) and Recommendation (183) on Safety and Health in Mines in 1995. In 2001, a group of experts representing government, labour and employers is expected to develop a code of practice on safety and health in the nonferrous metals industries that will provide specific guidelines for use throughout the sector.

United Nations Environment Programme (UNEP)

In November 1999, UNEP, together with the United Nations Department of Economic and Social Affairs and the Government of Germany, sponsored a Round Table on Mining and the Environment in Berlin. This meeting was in follow-up to a 1991 round table that produced the Berlin Guidelines – an overview of environmental guidelines and strategies for mining with an emphasis on developing countries.

The Berlin Round Table participants endorsed a new compendium of environmental guidelines intended to assist developing countries in promoting sustainable mineral development. These guidelines are now undergoing further consultation and will eventually be finalized and published by UNEP. Participants also called on the Commission on Sustainable Development to address the sustainable development of minerals and metals at a future session.

United Nations Commission on Sustainable Development (CSD)

The CSD was created to ensure effective follow up to the 1992 United Nations Conference on Environment and Development (UNCED). It meets annually to review the implementation of Agenda 21, the program of action adopted at UNCED. In 1997, a five-year work program for the CSD was adopted. Under this program, CSD-7 (1999) addressed the sectoral theme of oceans and seas and the cross-sectoral theme of changing consumption and production patterns. CSD-8 (2000) is expected to have greater relevance for the mining, minerals and metals industry in view of its focus on the integrated planning and management of land resources. CSD-8 will also begin preparations for the 10th anniversary of UNCED.

In preparation for CSD-8, Canada hosted, in June 1999, a visit by Joanne DiSano, Director of the UN Division on Sustainable Development, to meet with key government officials involved with natural resources and sustainable development. Canada is also preparing a series of monographs to table at CSD-8, including an update of a monograph prepared in 1997 on the sustainable development of minerals and metals.

Non-Ferrous Metals Consultative Forum on Sustainable Development

In December 1999, member countries of the three international nonferrous metals study groups – the International Copper Study Group, the International Nickel Study Group and the International Lead and Zinc Study Group – convened a Workshop on Sustainable Development. For the first time, governments, industry and other non-governmental organizations met to debate the key benefits and challenges related to how nonferrous metals contribute to sustainable development. An intergovernmental meeting following the workshop agreed that the process started by the workshop should continue and asked the Study Groups Advisory Committee to consider the outcomes and propose follow-up activities. Based on these discussions, member countries of the Study Groups agreed that a Consultative Forum with representation from all interested stakeholder groups should be held September 28-29, 2000. The purpose of the Forum will be to discuss

and develop components of an action plan based on workshop recommendations and on the way these components could be implemented for consideration by member countries of the Study Groups and others.

BILATERAL/REGIONAL AND OTHER DEVELOPMENTS

Americas

Pan-American Workshop on Occupational Safety and Health in Mining

In July 1999, Canada and Argentina sponsored, with the assistance of Chile and Peru, the Pan-American Workshop on Occupational Safety and Health in Mining. The Workshop was proposed by Colombia as an action plan project under the Buenos Aires Declaration following the 3rd Annual Mines Ministries of the Americas Conference in Buenos Aires in November 1998. The workshop focussed on three themes: Minerals, Metals, Markets and Social Development; The Safe Use Principle and its Elements; and Safe Use in Practice: Case Studies. The topics addressed included the global challenges facing the sustainable development of minerals and metals; the life cycle of minerals and metals; the importance of proper hazard identification, risk assessment and risk management practices; and industry presentations of best practices related to the safe production and processing of minerals and metals, product stewardship, recycling initiatives, sound environmental management practices, and community relations. The conclusions and recommendations of the workshop were incorporated and appended to the 1999 Caracas Declaration. These conclusions and recommendations are also available on the CAMMA web site at http://www.camma.org.

Fourth Annual Mines Ministers of the Americas Conference (IV CAMMA)

The IV CAMMA was held in October 1999 in Caracas, Venezuela. Eighteen countries in the Americas and Caribbean participated in the Conference, including two new member countries, Jamaica and Suriname, and six mining ministers. Other invited participants included representatives from non-governmental organizations, industry, Aboriginal communities, and international institutions. Both the World Bank and the UN Economic Commission for Latin America and the Caribbean gave presentations. Three themes were discussed and conclusions were prepared for consideration by ministers and delegates on Integrating Systems of Mining Information, Modernizing and Strengthening Mining Public Institutions, and Development of Non-Metallic Mining in the Americas. These conclusions were incorporated and appended to the 1999 Caracas Declaration wherein ministers and signatories recognized the importance and hemispheric benefit of disseminating information about each country's mining sector, the need for improved stakeholder communications and the implementation of transparent systems and procedures in modernizing and strengthening institutions in the mining sector, and the need to develop and increase nonmetallic (industrial) mining at the extraction and industrial level. The Caracas Declaration may be found on the CAMMA web site at http://www.camma.org.

Canada-U.S. Bilateral Consultations on the Tulsequah Chief Mine Project

In 1998, the United States asked Canada to refer the Tulsequah Chief mine project, located in northern British Columbia, to the Canada-U.S. International Joint Commission (IJC) for further review of key cross-border environmental concerns raised by the United States and the State of Alaska. The project, which had gone through a joint federal-provincial environmental assessment, had been approved by both levels of government in Canada. U.S. federal and Alaskan agencies had participated in the EA process although they had not joined in the recommendation for the project to be allowed to go ahead. Throughout the rest of 1998, Canada and the United States met through a bilateral consultation process. While some progress was made, a mutually satisfactory solution had not been achieved by the end of the year and consultations continued in 1999.

In 1999, several more meetings were held between Canada and the United States. Although some progress appeared to have been made, the United States maintained that the mine access road and the issue of cumulative effects on the watershed could not be separated and an IJC review of the Taku watershed should encompass the mine access road. The United States further indicated a desire to include Aboriginal groups that might feel the impacts of the mine development in future bilateral discussions. In the meantime, the B.C. government, in accordance with its permitting process, started several technical studies, some of which might address specific concerns raised by the United States.

Meetings between U.S. state and embassy personnel, B.C. officials and Alaskan governor Graham Knowles produced no significant breakthroughs. Further discussions continued at a number of levels and a bilateral meeting has now been tentatively scheduled for mid-May 2000. This meeting may represent the final opportunity to resolve this issue without a referral to the IJC.

Europe and Russia

Russia

A number of activities took place in 1999 to support mining investment made by Canadian companies in Russia. The Mining Working Group of the Canada-Russia Intergovernmental Economic Commission (IEC) continued to intensify its activities. In February 1999, a Deputy Prime Minister of the Russian Federation, His Excellency Gennady Vasilyevich Kulik, met with the federal ministers of Natural Resources and International Trade in Ottawa to discuss the efforts that were under way on Russian mineral investment climate issues. Natural Resources Canada and the Department of Foreign Affairs and International Trade (with the collaboration of the Canadian Embassy in Moscow) worked on a number of specific cases where their contribution enabled Canadian companies to suggest solutions to Russian authorities on problematic investment climate issues.

A Canadian government/industry mission went to Russia in April 1999. During this mission, Canadian mining companies and government officials were able to discuss the most pressing concerns of Canadian mining companies investing in Russia in meetings with high-ranking officials from Russian ministries, the State Duma and Deputy Prime Minister Kulik. Following that mission, the efforts of the Mining Working Group were directed at organizing a high-level seminar on investment concerns of Canadian companies who have invested in Russia. Participants invited to this seminar included Canadian and Russian company executives, senior government representatives, and officials from international financial institutions. The seminar will be held in March 2000 during Mining Millennium 2000 in Toronto.

Europe

In 1999, the European Commission continued to move forward on several key regulatory fronts that are likely to threaten Canadian nonferrous metals and asbestos producers. These initiatives fall under two related themes: waste management and risk management.

Directorate General XI (Environment) continued to advance three draft directives on managing waste arising from nonferrous metal-containing products: end-of-life vehicles, end-of-life electrical and electronic equipment, and nickel-cadmium batteries and accumulators. The EU is using these and other directives to ban or substantially restrict the use of key metals and metal compounds, including lead, mercury, cadmium and hexavalent chromium.

There are risk assessments of three metals under way by EU member states: cadmium (by Belgium), zinc (the Netherlands) and nickel (Denmark). Both the Commission and the member states are increasingly of the view that current risk assessment procedures should be replaced by a new precautionary approach. In early 2000 the EU will be releasing a Communication on the use of the Precautionary Principle that will define the circumstances under which regulations will be made in the absence of adequate scientific information. In addition, the EU feels there should be a broader use of the Substitution Principle (i.e., encourage substitution by less hazardous or dangerous substances) and the concept of a "reverse onus" where manufacturers and importers would be responsible for preparing both risk assessments and product safety assessments.

The Commission had also moved forward with a ban on asbestos. Although the Commission had subscribed to a controlled-use approach for many years, most of the member states had instituted bans and the Commission decided to follow suit in order to promote harmonization. On August 6, 1999, following approval by the Technical Progress Committee of a proposal submitted by the European Commission (EC) for the modification of an existing Directive on asbestos (76/769/EEC), the EC announced a ban of asbestos.

In a related move, in late 1998, and following unsuccessful consultations between the parties, Canada formally announced that it would challenge a French ban on the importation and use of asbestos using the WTO's dispute resolution mechanism. A panel was created in March 1999 and hearings began in June. The second phase of the panel process – further briefs and consultations with a committee of experts – was completed in January 2000. The panel is expected to render its decision in mid-2000.

Asia-Pacific

Asia-Pacific Economic Cooperation (APEC)

The Expert Group on Mineral and Energy Exploration and Development (GEMEED), a subgroup of APEC's Energy Working Group, held its fourth annual meeting in Bangkok, Thailand, in April 1999. GEMEED established its own web site at http://www.gemeed.cl.

Significant GEMEED activities and achievements during 1999 included:

- completing the second phase of the APEC Network of Mineral and Energy Data (ANMED), its Internet-based exploration database project comprising a wide variety of member economy information such as relevant mining and environmental legislation, and geoscientific data related to exploration (http://www.anmed.org);

- the Sub-Group on Environmental Cooperation, chaired by Japan, published the results of a study on Trends in International Environmental Law Affecting the Mining Industry, and set up the ECOW Virtual Centre (http://ecow.mmal.go.jp) to exchange information on environmental issues in APEC; and

- the third Environmental Cooperation Workshop for Sustainable Development of Mining Activities (ECOW'99), held in Cairns, Australia, which addressed three themes: Small- and Medium-Scale Mining, Life Cycle Analysis (LCA) Application to Nonferrous Metal Products, and Metals and the Environment.

China

In 1999, NRCan co-chaired the final meeting of the Canada/China Nonferrous Metals and Minerals Working Group in Ottawa. The Nonferrous Working Group, which addresses base metals and aluminum, was co-chaired with the State Non-Ferrous Metals Industry Administration (SNMIA), the successor to the China National Nonferrous Metals Industry Corporation. The meeting provided opportunities to exchange information on each country's minerals industry and to discuss issues related to business climate and possible areas of collaboration in science and technology.

The SNMIA, a policy and management body, also retains decision-making power over the CNNC's former "enterprises" during a three-year transition period. Three commodity groups – China Aluminium Group Corporation, China Copper Lead and Zinc Group, and China Rare Metals and Rare Earth Corporation – were established. Some 135 major state-owned companies will be run by these three new groups.

Formed by the recent restructuring, the Ministry of Land and Resources (MLR), which reports directly to the State Council, is the only organization among government entities responsible for mining and minerals that has a full ministry status. The MLR is working with provincial governments to improve China's regulatory climate for mineral exploration and mining. The Chinese government had designated Yunnan Province as a "Pilot Region" for fast-tracked and streamlined approvals for mining exploration and development by foreign companies.

Among its other responsibilities, the MLR will be involved in sustainable development, protection of the environment, international cooperation and exchanges with foreign countries, and broad land-use management. NRCan is negotiating a framework MOU with the MLR that will cover a number of these areas and that will likely be signed in early 2000.

Arctic

Arctic Council

The Arctic Council was established on September 19, 1996, in Ottawa, Canada. A high-level intergovernmental forum, the Council provides a mechanism to address the common concerns and challenges faced by Arctic governments and the people of the Arctic.

The members of the Council are Canada, Denmark, Finland, Iceland, Norway, the Russian Federation, Sweden and the United States. The Association of Indigenous Minorities of the North, Siberia and the Far East of the Russian Federation, the Inuit Circumpolar Conference, and the Saami Council are permanent participants in the Council. There are provisions for non-Arctic states, intergovernmental and inter-parliamentary organizations, and non-governmental organizations to become involved as observers, e.g., Germany, the Netherlands, Poland, the United Kingdom, the Nordic Council, the Northern Forum, the United Nations Economic Commission for Europe, the United Nations Environment Programme, and the International Arctic Science Committee.

The Council meets biennially at the ministerial level. The Chair and Secretariat of the Council rotate every two years among the eight Arctic states, beginning with Canada in 1996 and moving to the United States in 1998. In October 2000, in Barrow, Alaska, the Arctic Council's second ministerial meeting will take place to elect a new chair. It is anticipated that Finland will be elected to this position.

Since its inception, the Arctic Council's work plan has expanded to five working groups that address a number of issues of relevance to the minerals and metals industry. These working groups are described briefly below.

The Arctic Monitoring and Assessment Program (AMAP) has the responsibility to monitor the levels of, and assess the effects of, anthropogenic pollutants in all compartments of the Arctic environment, including humans, e.g., in 1999 AMAP began an initiative to expedite the phase-out of the use of polychlorinated biphenyls (PCBs) in the Russian Federation and to further develop environmentally sound disposal practices in Russia, especially in the Russian Arctic.

Conservation of Arctic Flora and Fauna (CAFF) addresses the special needs of Arctic species and their habitats in the rapidly developing Arctic region, e.g., the establishment of protected areas in the Arctic region where they contribute to the conservation of ecosystems, habitats and species.

Emergency Prevention, Preparedness and Response (EPPR) is an experts forum to evaluate the adequacy of existing arrangements and to recommend the necessary system of cooperation. In addition, they provide an assessment of national activities having the potential for transboundary impacts and of the effectiveness of national, bilateral and multilateral legal instruments and agreements to prevent, prepare for and respond to each.

Protection of the Arctic Marine Environment (PAME) addresses policy and non-emergency response measures related to protection of the marine environment from land and sea-based activities. PAME cooperates with the other working groups under the Arctic Environmental Protection Strategy on the following topics: pollution prevention and control, habitat protection and biodiversity, identification and assessment of problems, and sustainable development and environmental protection.

The Sustainable Development Working Group's (SDWG) objective is to protect and enhance the economies, culture and health of the inhabitants of the Arctic in an environmentally sustainable manner. Currently, the SDWG is working on projects in the areas of Arctic children and youth, health, telemedicine, resource management, technology transfer to improve Arctic sanitation systems, national sustainable development strategies, living conditions in the Arctic, and linking Arctic communities.

Notes: (1) Information in this review was current as of December 31, 1999. (2) This and other reviews, including previous editions, are available on the Internet at http://www.nrcan.gc.ca/mms/cmy/index_e.html.

NOTE TO READERS

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Canada's Global Mining Presence

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GLOBAL MARKET FOR EXPLORATION

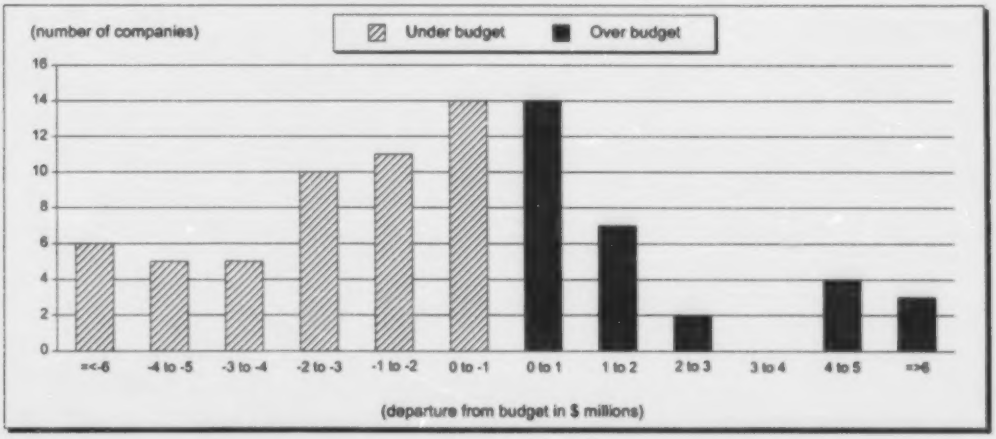
Although it continued to be difficult to raise risk capital during 1998, exploration programs around the world by companies of all sizes for precious metals, base metals and diamonds were, in total, only about 3% below budget. In 1999, global exploration activity by these companies fell to an estimated $4.0 billion (US$2.7 billion) from $5.0 billion (US$3.5 billion) the previous year, or down by over 20%. Programs were reduced in most countries, but were postponed or abandoned entirely in some developing countries.

Global trends in worldwide mineral exploration are based largely on data for the world's larger companies,[1] defined here as those with annual exploration budgets greater than $4 million (US$3 million). In 1999, 132 companies planned to spend more than $4 million on exploration, down from a record 279 in 1997. During 1999, the world's larger companies were expected to undertake programs with a combined value of $3.2 billion (US$2.2 billion), which represents an estimated 80% of the global market for mineral exploration.

LARGER CANADIAN-BASED COMPANIES

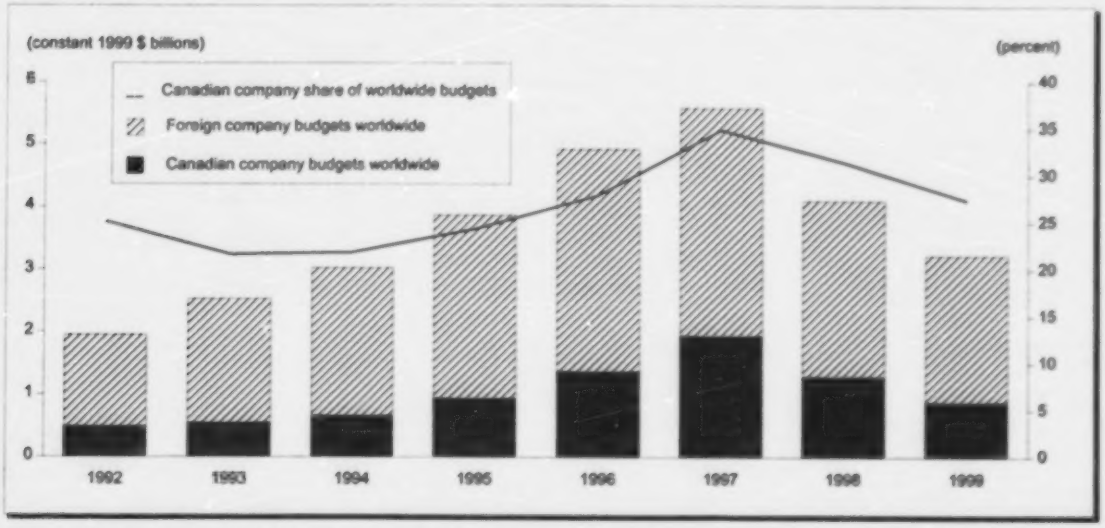
During 1998, the larger Canadian-based companies underspent their exploration budgets, in aggregate, by almost $86 million, or by about 7% less than they had planned (Figure 1). Two thirds of them (51 companies) spent less than budgeted, while a little more

Figure 1
Departure of Global Exploration Expenditures from Budgets, 1998
Canadian-Based Companies with Budgets of at Least $4 Million for Precious-Metal, Base-Metal or Diamond Exploration



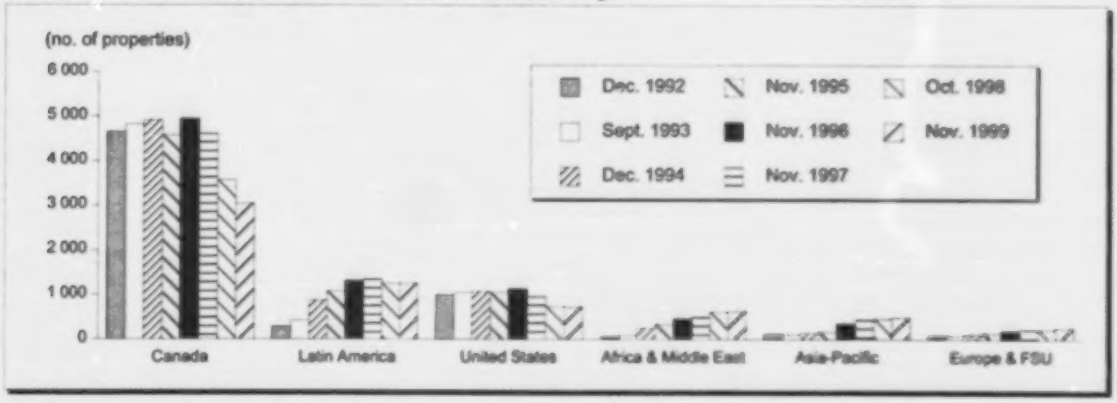
Source: Natural Resources Canada, based on *Corporate Exploration Strategies: A Worldwide Analysis*, Metals Economics Group, Halifax, Nova Scotia.
Note: During 1998, the aggregate expenditures of Canadian-based companies were almost $86 million, or about 7% lower than previously budgeted.

Figure 2
Exploration Budgets of the World's Larger Companies, by Origin, 1992-99
Companies with Worldwide Budgets of at Least $4 Million for Precious-Metal, Base-Metal or Diamond Exploration



Source: Natural Resources Canada, based on *Corporate Exploration Strategies: A Worldwide Analysis*, Metals Economics Group, Halifax, Nova Scotia.
Notes: The worldwide exploration budgets of companies that intended to spend less than $4 million (US$3 million) annually are excluded. The worldwide exploration budgets for other commodities such as uranium or industrial minerals are also excluded.

Figure 3
Canadian Mineral Property Portfolio Worldwide, by Region, 1992-99
Companies of All Sizes Listed on Canadian Stock Exchanges



Source: Natural Resources Canada, based on *MIN-MET CANADA* for 1992-97 and InfoMine db for 1998 and 1999, Robertson Info-Data Inc., Vancouver, British Columbia, and used under licence.
Note: The decrease in properties in Canada after 1997 is due mainly to the implementation of database features that make it possible to exclude many inactive properties.

than 30% (25 companies) spent more than budgeted. Individual company departures from 1998 plans ranged from $10 million under budget to $17 million over budget. In general, companies that exceeded their program budgets during 1998 did so in response to new discoveries or other opportunities that arose during the year.

Many exploration companies derive little or no substantial revenues from mineral production and, therefore, rely almost entirely on the stock market to finance their exploration programs. In 1996, mining companies listed on Canadian stock exchanges raised a record amount of capital.[2] As a result, a record 141 Canadian-based companies each planned to spend more than $4 million on exploration around the world during that year. Their aggregate exploration budgets, adjusted for inflation, stood at a record $1.9 billion. Because of investor uncertainty since 1997, the number of Canadian-based companies that planned to spend more than $4 million on exploration in 1999 decreased to 47. The total amount that these companies planned to spend on mineral exploration in both Canada and elsewhere around the world fell to $884 million in 1999 (Figure 2) from $1.3 billion the previous year, or down by 32%. Nonetheless, during 1999, Canadian-based companies planned to undertake almost 30% of all the larger-company exploration programs around the world, about the same amount as companies based in Australia. In 1997, Canadian programs accounted for a record 35%, which is the dominant share, by far, of all worldwide mineral exploration activity.

Relatively fewer of the many companies that budgeted only somewhat more than $4 million in 1998 were able to raise a similar amount for exploration in 1999. As a result, the average company budget for 1999 increased. In the case of the larger Canadian-based companies, the mean budget increased to $24.5 million and the median to $10.4 million, up from $15.4 million and $7.1 million, respectively, the previous year.

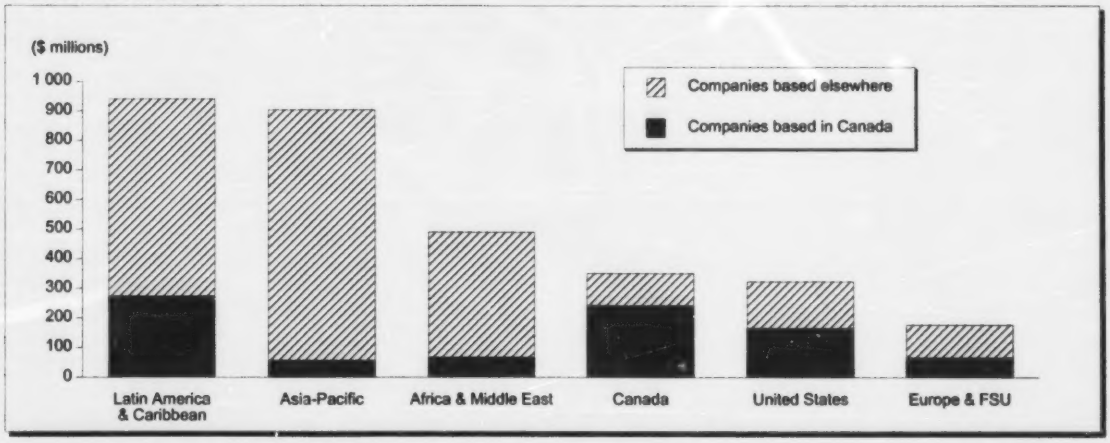
At the end of 1999, companies of all sizes listed on Canadian stock exchanges held interests in a portfolio of more than 6300 properties (Figure 3) located in Canada or in more than 100 countries around the world.[3] Most of this portfolio is at the exploration stage.

LARGER-COMPANY EXPLORATION MARKET IN CANADA

In 1999, the larger-company mineral exploration market in Canada was valued at about $350 million (Figure 4). The balance of the Canadian market is held mainly by smaller companies, the activities of which are not addressed specifically here.

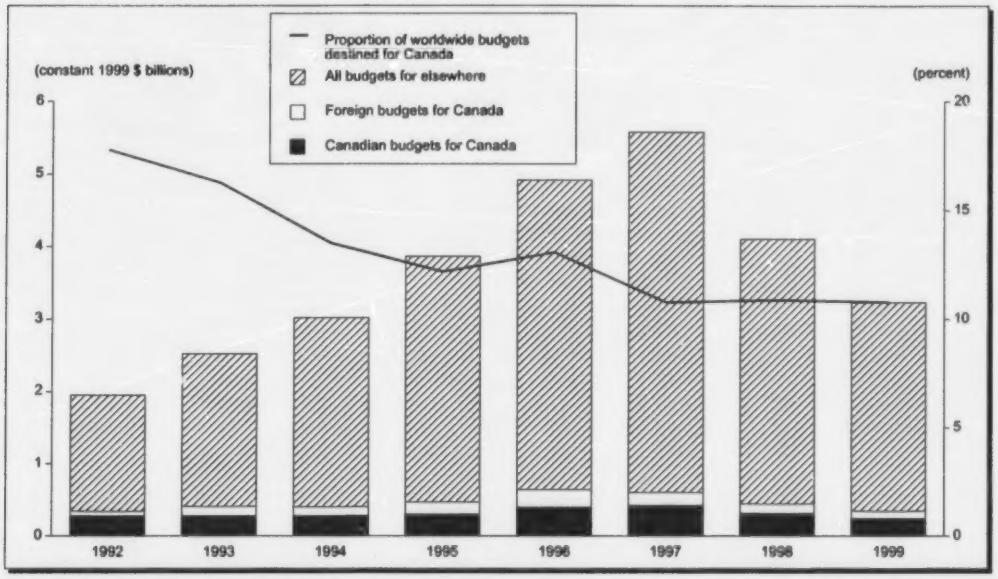
During 1999, 48 of the world's larger domestic-based or foreign-based companies planned to explore for minerals in Canada. Their aggregate budgets were down by almost $100 million, or by almost 25%, compared with those of the previous year. Nonethe-

Figure 4
Exploration Budgets of the World's Larger Companies for Selected Regions of the World, 1999
Companies with Worldwide Budgets of at Least $4 Million for Precious-Metal, Base-Metal or Diamond Exploration



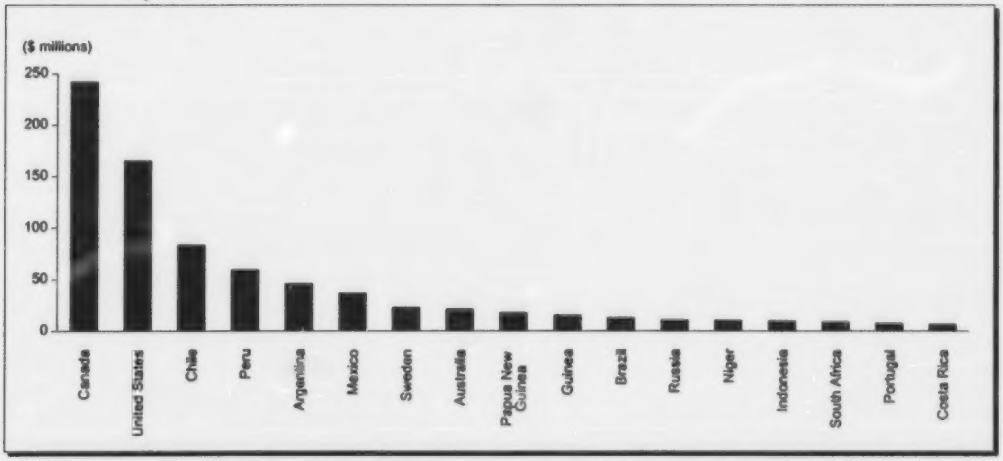
Source: Natural Resources Canada, based on *Corporate Exploration Strategies: A Worldwide Analysis*, Metals Economics Group, Halifax, Nova Scotia.
Notes: The worldwide exploration budgets of companies that intended to spend less than $4 million (US$3 million) annually are excluded. The worldwide exploration budgets for other commodities such as uranium or industrial minerals are also excluded.

Figure 5
Exploration Budgets of the World's Larger Companies for Canada and Elsewhere, 1992-99
Companies with Worldwide Budgets of at Least $4 Million for Precious-Metal, Base-Metal or Diamond Exploration



Source: Natural Resources Canada, based on *Corporate Exploration Strategies: A Worldwide Analysis*, Metals Economics Group, Halifax, Nova Scotia.
Notes: The worldwide exploration budgets of companies that intended to spend less than $4 million (US$3 million) annually are excluded. The worldwide exploration budgets for other commodities such as uranium or industrial minerals are also excluded.

Figure 6
Exploration Budgets of the Larger Canadian-Based Companies, 1999 – Countries Accounting for 90% of Canadian Budgets
Companies with Worldwide Budgets of at Least $4 Million for Precious-Metal, Base-Metal or Diamond Exploration



Source: Natural Resources Canada, based on *Corporate Exploration Strategies: A Worldwide Analysis*, Metals Economics Group, Halifax, Nova Scotia.
Notes: The worldwide exploration budgets of companies that intended to spend less than $4 million (US$3 million) annually are excluded. The worldwide exploration budgets for other commodities such as uranium or industrial minerals are also excluded.

less, almost 11% of the exploration programs of all the world's larger companies were destined for Canada (Figure 5), nearly the same as in 1997 and 1998. However, the proportion of worldwide exploration activity taking place in Canada has fallen gradually each year from about 18% in 1992 because of the large increase in exploration activity that occurred in developing countries starting in the early 1990s. At the end of 1999, there were more than 3000 mineral properties with recent exploration activity in this country (Figure 3).[4]

In 1999, 34 of the larger Canadian-based companies allocated over $240 million for exploration in Canada. This represents a reduction of almost $71 million, or 23%, from the more than $310 million budgeted in 1998. Canadian-based companies control almost 70% of the larger-company market in Canada. Australia is the only other country where domestic companies control more than half of the larger-company market for mineral exploration. In 1992, Canadian-based companies controlled 80% of the larger-company market in Canada but, with increasing globalization, their share has fallen gradually as foreign-based companies have increased their investment in this country. The share of the exploration market controlled by the larger domestic firms has also fallen in the United States, Australia and Latin America. Still, Canada remains the country for which Canadian companies budget the most, by far, for mineral exploration programs (Figure 6).

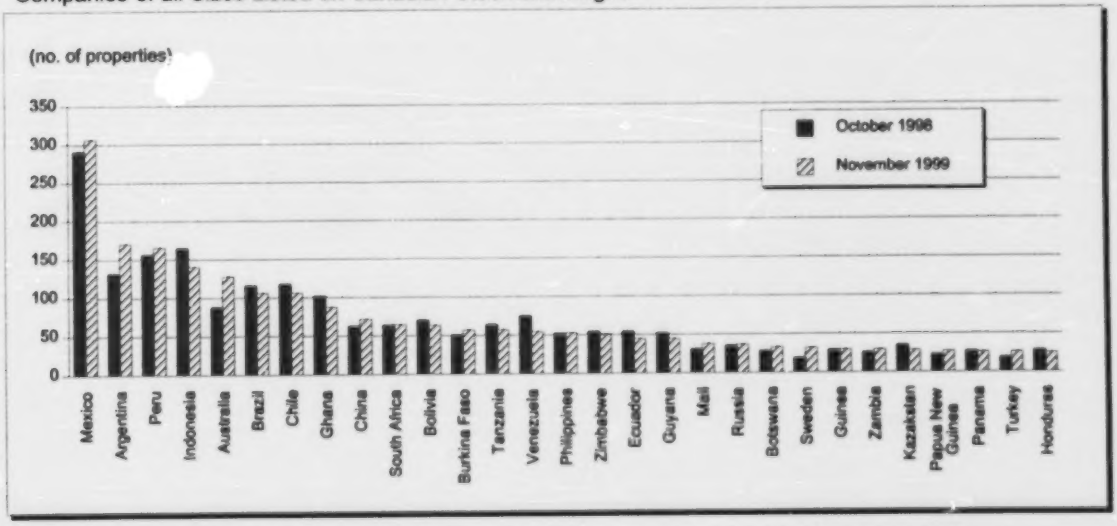
During 1999, the larger foreign-based multinationals planned to spend over $100 million on mineral exploration in Canada (Figure 5), or more than 30% of all exploration programs planned for this country. Compared with 1998, their budgets decreased by almost $30 million, or by about one quarter.

The larger foreign-based companies active in Canada include: The Broken Hill Proprietary Company Limited (BHP) and WMC Limited, both based in Australia; Battle Mountain Gold Company, Echo Bay Mines Ltd., Freeport-McMoRan Copper & Gold Inc., Homestake Mining Company, Newmont Mining Corporation and Phelps Dodge Corporation, all based in the United States; Anglo American plc, Billiton plc, Outokumpu Oyj and Rio Tinto plc, all based in Europe; and Anglo American Platinum Corporation Limited and De Beers Consolidated Mines, Limited, both based in South Africa.

LARGER CANADIAN-BASED COMPANIES ABROAD

In 1999, the larger Canadian-based companies planned to spend more than $640 million on

Figure 7
Canadian Mineral Property Portfolio Abroad, 1998 and 1999 – Countries Accounting for 80% of Canadian Holdings Located Outside the United States in 1999
Companies of all Sizes Listed on Canadian Stock Exchanges



Source: Natural Resources Canada, based on InfoMine db, Robertson Info-Data Inc., Vancouver, British Columbia, and used under licence.

mineral exploration outside Canada (Figure 4). This represents a 35% decrease from the more than $980 million they planned to spend in 1998. The proportion of their total budgets allocated to foreign programs was almost 73% in 1999. That proportion peaked at over 78% in 1997; it was only 43% in 1992.

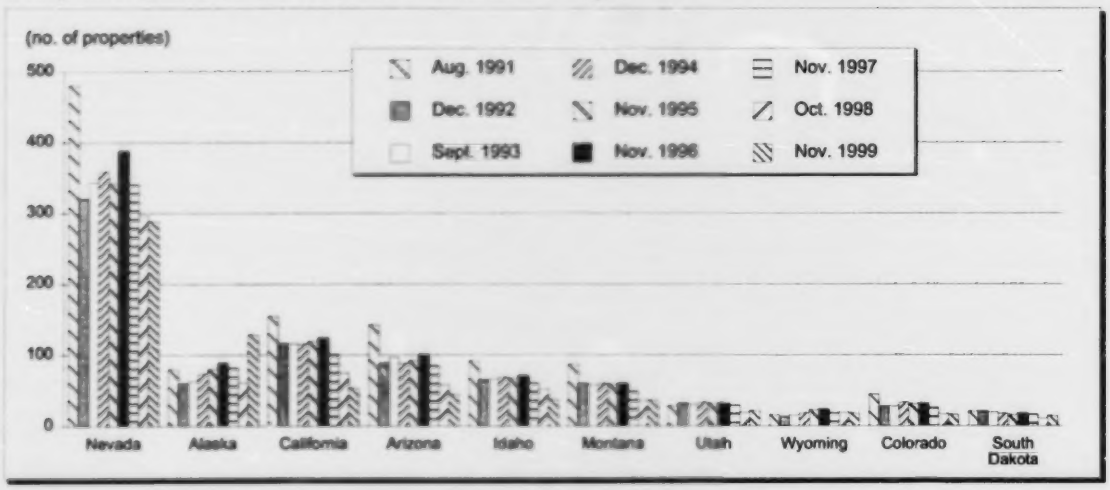
At the end of 1999, companies of all sizes listed on Canadian stock exchanges held interests in a portfolio of over 3300 mineral properties located abroad (Figure 3). Foreign properties now represent more than half of the total mineral property portfolio held by these companies, up from about 25% in 1992.[5] Between 1992 and 1999, their holdings of foreign mineral properties grew at an average annual compound rate of about 12%. Apart from the United States, where companies of all sizes listed on Canadian stock exchanges have a substantial mining presence, about 30 other nations, spread across the globe, account for 80% of the balance of their mineral property portfolio held abroad (Figure 7). Canadian companies have interests in 150 operating mines, smelters or refineries in over 40 foreign countries (Table 1). Several of their other advanced projects in these countries and elsewhere are either under construction or awaiting the results of a final production feasibility study. Their other projects are at the exploration stage.

United States

In 1999, the larger-company mineral exploration market in the United States was valued at over $320 million (Figure 4), or about 10% of the $3.2 billion larger-company market worldwide. In spite of global retrenchment, over 30 of the larger Canadian-based companies planned to spend about $165 million in total in the United States, slightly more than in 1998. Because companies based in most other countries considerably reduced their exploration programs for the United States during 1999, Canadian-based companies increased their share of the larger-company exploration market in that country to 51%. Canadian-based companies have increased their share of the exploration market in the United States each year since the early 1990s. The exploration budgets of the larger Canadian-based companies for the United States have grown at an average annual compound rate of about 10% since the early 1990s. The United States ranks second after Canada as the country where Canadian companies are the most active (Figure 6).

Canadian companies planned to spend over $70 million more than U.S. companies in the United States during 1999. American companies have budgeted decreasing amounts for exploration in the United States each year since the early 1990s. Although they accounted for almost 60% of the exploration programs there in 1992, they accounted for only 29% in 1999.

Figure 8
Canadian Mineral Property Portfolio in the United States, 1991-99 – States Accounting for 90% of Canadian Holdings in 1999
Companies of all Sizes Listed on Canadian Stock Exchanges



Source: Natural Resources Canada, based on *MIN-MET CANADA* for 1991-97 and InfoMine db for 1998 and 1999, Robertson Info-Data Inc., Vancouver, British Columbia, and used under licence.

In late 1999, companies of all sizes listed on Canadian stock exchanges held over 700 mineral properties in the United States (Figure 3). They had projects in 22 states, but mainly in the western part of the country in Nevada, Alaska, California, Arizona, Idaho, Montana, Utah, Wyoming, Colorado and South Dakota (Figure 8). Nevada alone accounted for almost 300 of their mineral properties, or about 40% of the total Canadian portfolio in the United States.

Although Canadian companies have expanded their activities considerably in Latin America, Africa and Asia since the early 1990s, the United States is likely to remain, for the foreseeable future, the foreign country where they hold their largest portfolio of mineral properties. At the end of 1999, the United States accounted for over 20% of all properties held abroad by these companies.

Of all the Canadian-based companies, Placer Dome Inc., Barrick Gold Corporation, Teck Corporation and Cominco Ltd. planned the largest exploration programs in the United States during 1999. Together they planned to spend more than $120 million, or over 70% of Canadian budgets for that country. Teck planned to spend much of its $25 million budget for the United States at the Pogo gold deposit in Alaska. Placer Dome planned to spend about 80% of its $45 million budget for the United States at the Getchell gold mine in Nevada. Barrick planned to spend over $30 million, much of it on further exploration in and around its mining operations in Nevada. Cominco planned to spend a good portion of its $19 million budget for the United States at the Red Dog mine in Alaska.

Latin America and the Caribbean

In 1999, the larger-company mineral exploration market in Latin America and the Caribbean was valued at $940 million (Figure 4), or almost 29% of the $3.2 billion larger-company market worldwide. Latin America accounts for the largest concentration of Canadian mineral exploration activity around the world. During 1999, the larger Canadian-based companies planned to spend over $270 million there. However, this amount represents a decrease of more than $175 million, or over 39%, compared with 1998.

In spite of significant decreases since 1997, the exploration budgets of the larger Canadian-based companies for Latin America and the Caribbean have grown at an average annual compound rate of 18% between 1992 and 1999. In 1999, these companies held more than 29% of the larger-company market in the region, by far the largest share. In addition, they held the dominant share of the exploration activity in several countries in the region.

At the end of 1999, companies of all sizes listed on Canadian stock exchanges held interests in over 1200 mineral properties in the region. Since 1996, the total number of mineral properties held by Canadian companies in Latin America and the Caribbean has exceeded the number held in the United States (Figure 3).

Mexico

In 1999, the larger-company mineral exploration market in Mexico was valued at almost $140 million, or more than 4% of the $3.2 billion larger-company market worldwide. Fourteen of the larger Canadian-based companies planned to spend, in total, more than $36 million in that country, equivalent to 30% of the market. Mexico ranks fourth in Latin America and sixth in the world as the country where Canadian companies are the most active (Figure 6).

During 1994, there was a significant increase in the average size of the mineral property portfolio held in Mexico by companies of all sizes listed on Canadian stock exchanges. At the end of 1999, these companies held interests in more than 300 properties in 20 of the country's 31 states or district (Figure 9).

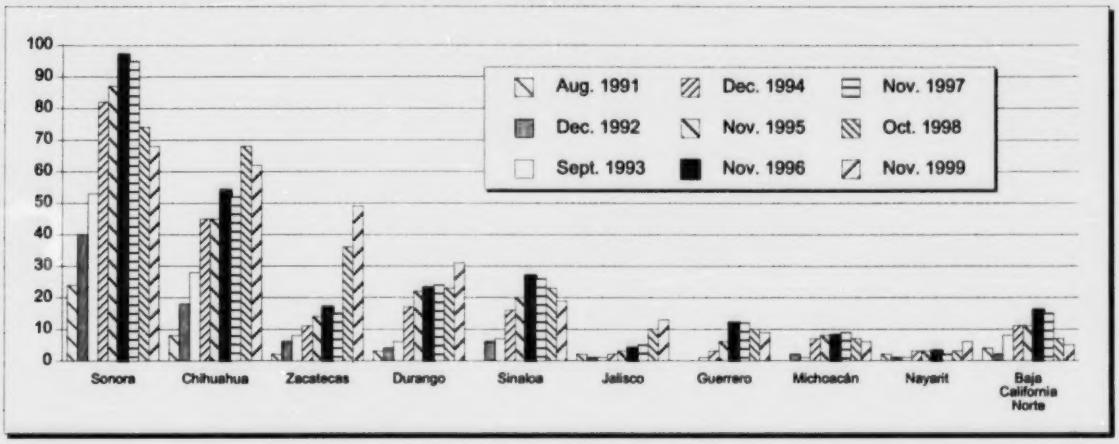
Cambior inc. planned the largest Canadian exploration program in Mexico during 1999. It planned to spend over $12 million there, 80% of that amount on the Cerro San Pedro gold-silver project.

South America

In 1999, the larger-company mineral exploration market in South America was valued at over $740 million, slightly more than 20% of the $3.2 billion larger-company market worldwide. Twenty-three of the larger Canadian-based companies planned to spend around $220 million in total in the region, approximately 30% of the market there. Canadian companies held the dominant share of the market in Argentina, Chile, Colombia and Peru.

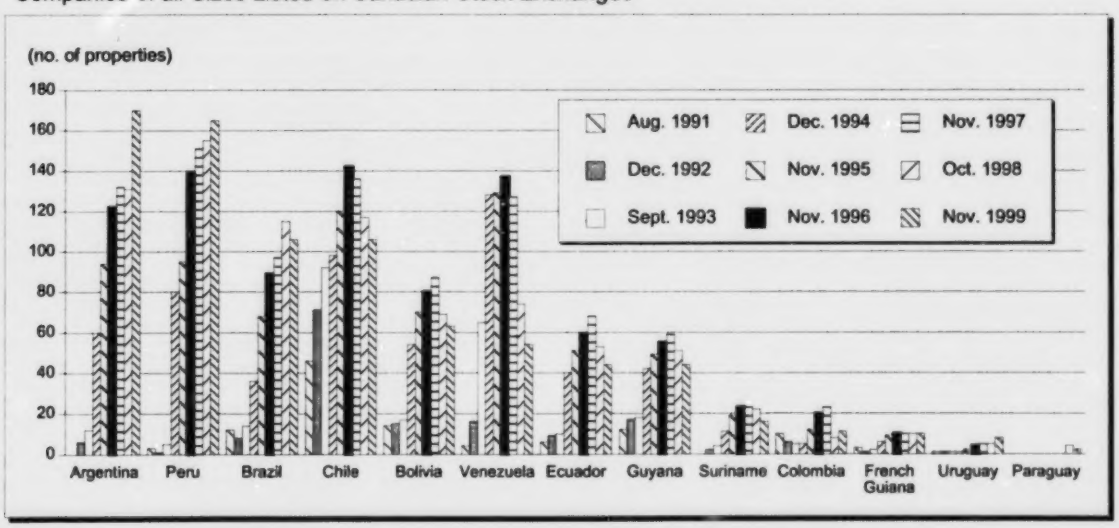
Chile is the country of South America where Canadian-based companies conduct the largest portion of their exploration programs (Figure 6). Chile also ranks third in the world as the country where Canadian companies are the most active. In 1999, Placer Dome and Barrick were expected to conduct about 25% of all the exploration programs planned for Chile. Placer Dome planned to spend most of its almost $29 million budget for Chile on the Cerro Casale (Aldebaran) gold-copper project. Barrick planned to spend most of its $25 million budget for Chile exploring the Pascua gold project. Elsewhere in South America, Barrick planned the largest exploration program in Argentina. It planned to spend most of its $31 million budget for that country on the extension of the Pascua deposit from Chile into Argentina. Greystar Resources Ltd. planned to spend more than $5 million in Colombia, and Cambior planned to spend over $2 million in proximity to the

Figure 9
Canadian Mineral Property Portfolio in Mexico, 1991-99 – States Accounting for 90% of Canadian Holdings in 1999
Companies of all Sizes Listed on Canadian Stock Exchanges



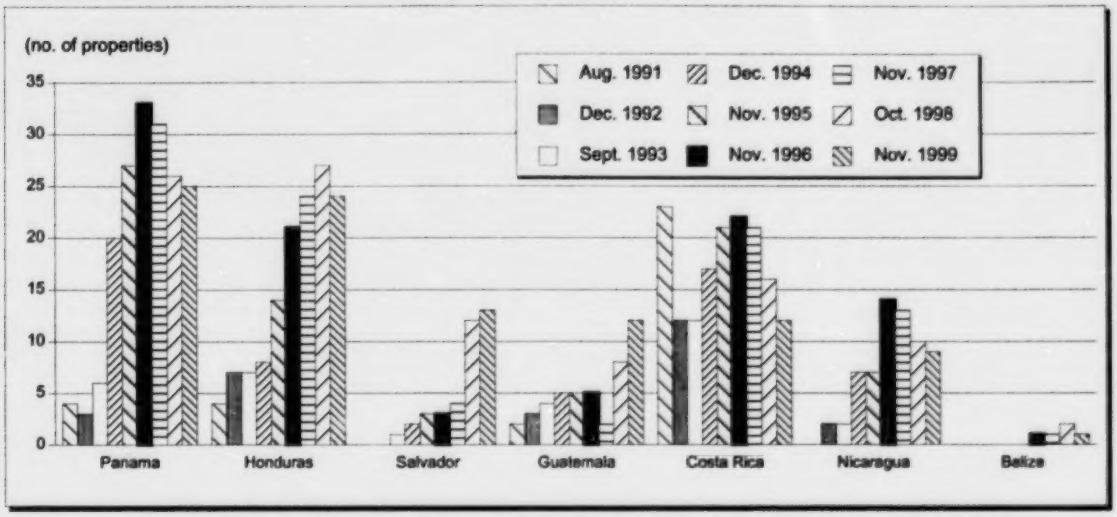
Source: Natural Resources Canada, based on *MIN-MET CANADA* for 1991-97 and InfoMine db for 1998 and 1999, Robertson Info-Data Inc., Vancouver, British Columbia, and used under licence.

Figure 10
Canadian Mineral Property Portfolio in South America, by Country, 1991-99
Companies of all Sizes Listed on Canadian Stock Exchanges



Source: Natural Resources Canada, based on *MIN-MET CANADA* for 1991-97 and InfoMine db for 1998 and 1999, Robertson Info-Data Inc., Vancouver, British Columbia, and used under licence.

Figure 11
Canadian Mineral Property Portfolio in Central America, by Country, 1991-99
Companies of all Sizes Listed on Canadian Stock Exchanges



Source: Natural Resources Canada, based on *MIN-MET CANADA* for 1991-97 and InfoMine db for 1998 and 1999, Robertson Info-Data Inc., Vancouver, British Columbia, and used under licence.

Omai gold mine in Guyana. Cambior also planned to spend almost $16 million in Peru, including over $9 million on the Huamachuco gold project (Virgen and La Arena properties) and more than $3 million on the La Granja copper-gold project.

At the end of 1999, companies of all sizes listed on Canadian stock exchanges held 800 mineral properties throughout South America. They held about 170 properties in each of Argentina and Peru, more than 100 in each of Brazil and Chile, and more than 50 in each of Bolivia and Venezuela (Figure 10).

Central America

In 1999, the larger-company mineral exploration market in Central America was valued at about $10 million, or less than 1% of the $3.2 billion larger-company market worldwide. Six of the larger Canadian-based companies planned to spend about 70% of that amount.

Canadian-based companies planned to conduct all of the exploration programs in three countries in the region: Lyon Lake Mines Ltd. planned to spend over $6 million at the Crucitas deposit in Costa Rica, Kinross Gold Corporation planned to spend over $0.4 million at the El Dorado gold project in Salvador, and Aur Resources Inc. planned to spend over $0.4 million at the Cerro Colorado copper deposit in Panama.

At the end of 1999, companies of all sizes listed on Canadian stock exchanges held about 100 mineral properties throughout Central America. They held 20 or more in each of Honduras and Panama (Figure 11).

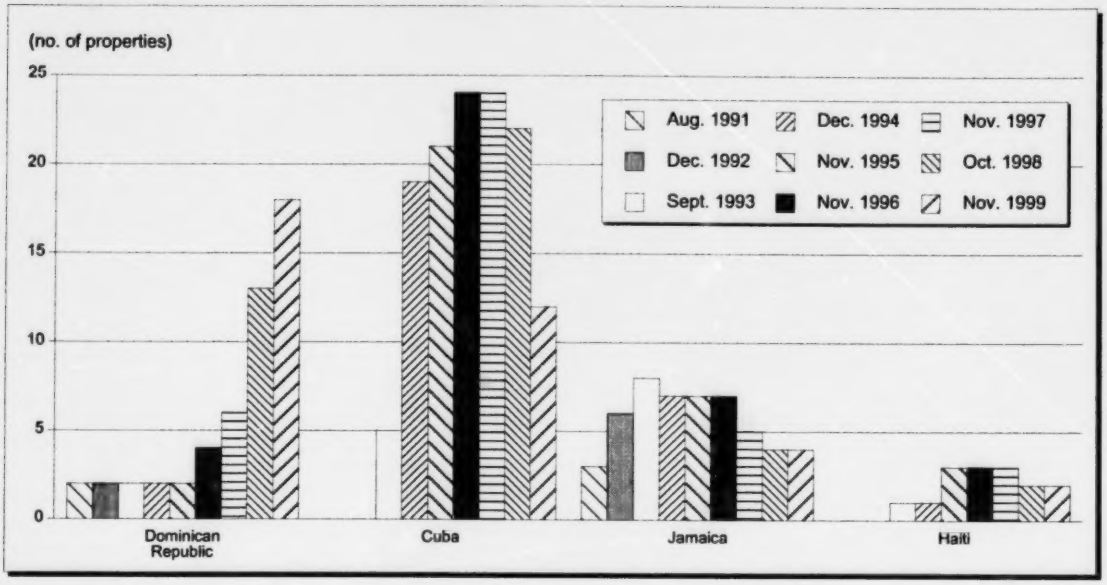
Caribbean

In 1999, the larger-company mineral exploration market in the Caribbean was valued at about $15 million. The larger Canadian-based companies reported no exploration programs for that region. At the end of 1999, companies of all sizes listed on Canadian stock exchanges held about 40 mineral properties in the Caribbean, most of them in the Dominican Republic and Cuba (Figure 12).

Europe and the Former Soviet Union

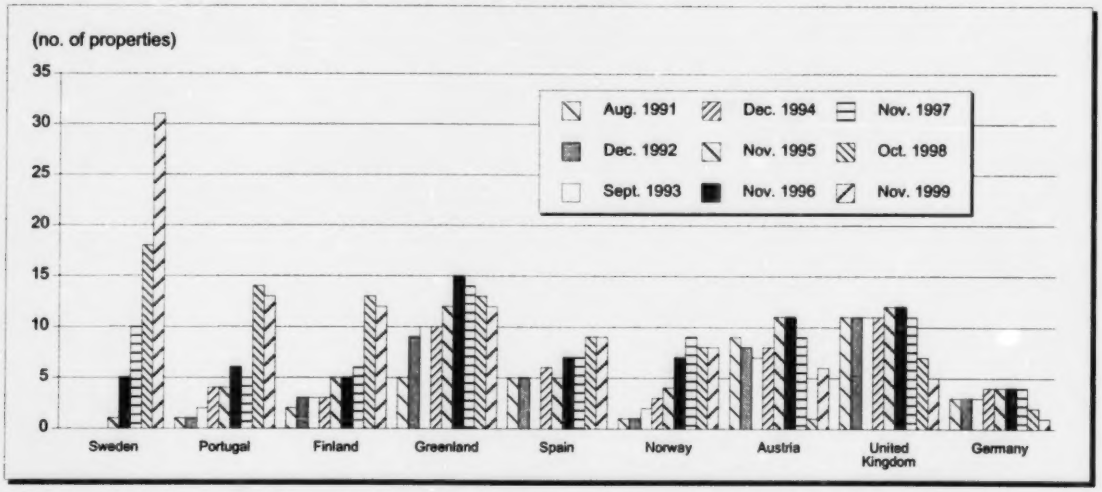
In 1999, the larger-company mineral exploration market in Europe and the Former Soviet Union (FSU) was valued at over $175 million (Figure 4), or roughly 5% of the $3.2 billion larger-company market worldwide. The larger Canadian-based companies planned to spend almost $70 million there, equivalent to 40% of the market. At the end of 1999, companies of all sizes listed on Canadian stock exchanges held about 250 mineral properties in the region (Figure 3).

Figure 12
Canadian Mineral Property Portfolio in the Caribbean, by Country, 1991-99
Countries With Canadian Holdings in 1999
Companies of all Sizes Listed on Canadian Stock Exchanges



Source: Natural Resources Canada, based on *MIN-MET CANADA* for 1991-97 and InfoMine db for 1998 and 1999, Robertson Info-Data Inc., Vancouver, British Columbia, and used under licence.

Figure 13
Canadian Mineral Property Portfolio in Western Europe, 1991-99 –
Countries Accounting for 95% of Canadian Holdings in 1999
Companies of all Sizes Listed on Canadian Stock Exchanges



Source: Natural Resources Canada, based on *MIN-MET CANADA* for 1991-97 and InfoMine db for 1998 and 1999, Robertson Info-Data Inc., Vancouver, British Columbia, and used under licence.

Western Europe

In 1999, the larger-company mineral exploration market in western Europe was valued at over $75 million, or roughly 2% of the $3.2 billion larger-company market worldwide. The larger Canadian-based companies planned to spend $40 million there, equivalent to more than half of the market. They held the dominant share in Greenland, Portugal and Sweden.

During 1999, Canadian-based companies planned the largest programs in three countries of western Europe: Dia Met Minerals Ltd. planned to spend over $3 million on exploration for diamonds in Greenland, EuroZinc Mining Corporation planned to spend over $7 million on the Aljustrel zinc-lead-silver deposit in Portugal, and Boliden Limited planned to spend 80% of its more than $22 million budget for Europe mainly at the Renström, Petiknäs and Kristineberg mines in Sweden.

At the end of 1999, companies of all sizes listed on Canadian stock exchanges held more than 100 mineral properties in western Europe. They held more than 30 in Sweden and more than 10 in each of Portugal, Finland and Greenland (Figure 13).

Eastern Europe

In 1999, the larger-company mineral exploration market in eastern Europe was valued at about $20 million, or roughly 1% of the $3.2 billion larger-company market worldwide. The larger Canadian-based companies planned to spend about $9 million there, equivalent to almost half of the market.

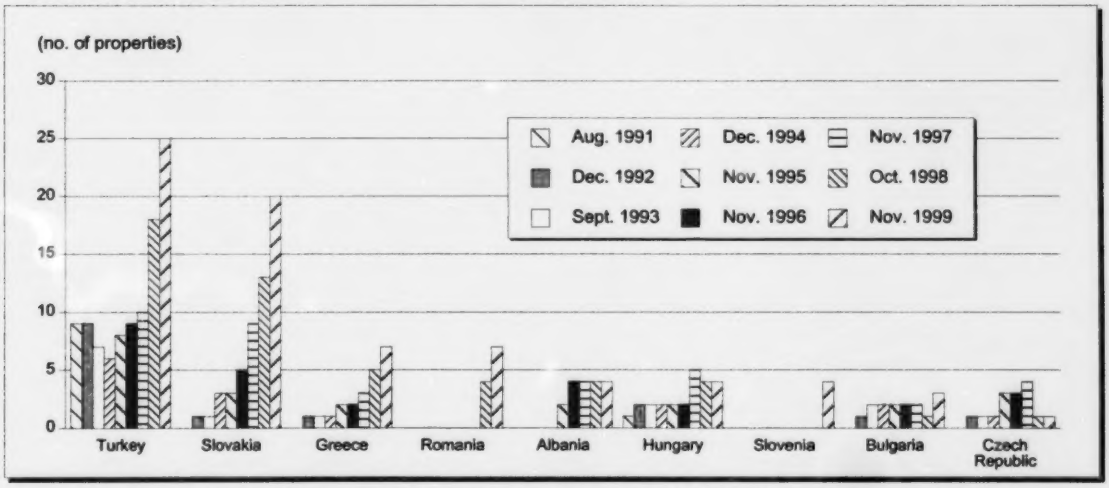
Canadian-based companies held the dominant share of the market in two countries of eastern Europe. In Romania, Gabriel Resources Limited planned to spend over $5 million on the Rosia Montana gold-silver deposit; in Turkey, Cominco and Inco Limited each planned to spend over $0.75 million on grass-roots exploration for base metals and Inmet Mining Corporation planned to spend about $0.5 million on mine-site exploration for gold.

At the end of 1999, companies of all sizes listed on Canadian stock exchanges held 75 mineral properties in eastern Europe. They held 20 or more in each of Turkey and Slovakia (Figure 14).

Former Soviet Union

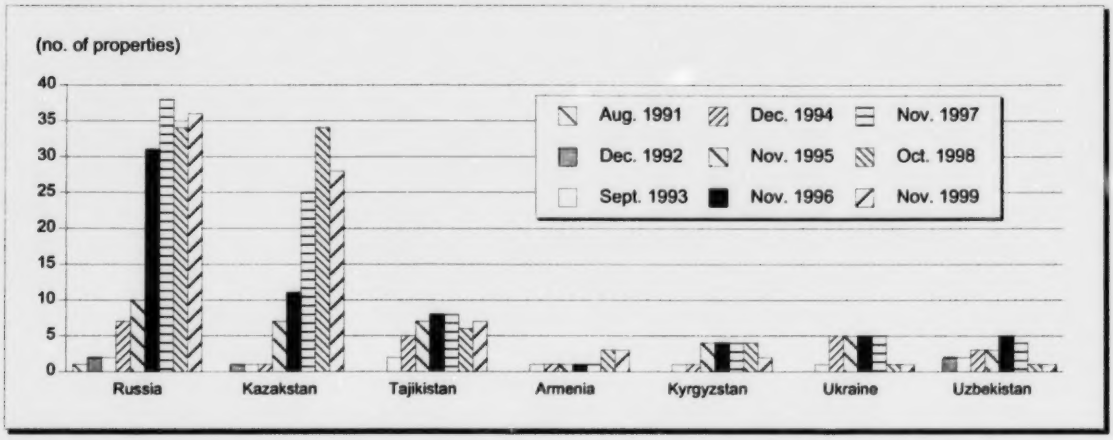
In 1999, the larger-company mineral exploration market in the countries of the FSU was valued at about $70 million, or roughly 2% of the $3.2 billion larger-company market worldwide. The larger Canadian-based companies planned to spend about $15 million in these countries. At the end of 1999, companies of all sizes listed on Canadian stock exchanges held interests in almost 80 mineral properties in seven countries of the FSU (Figure 15).

Figure 14
Canadian Mineral Property Portfolio in Eastern Europe, 1991-99
Countries With Canadian Holdings in 1999
Companies of all Sizes Listed on Canadian Stock Exchanges



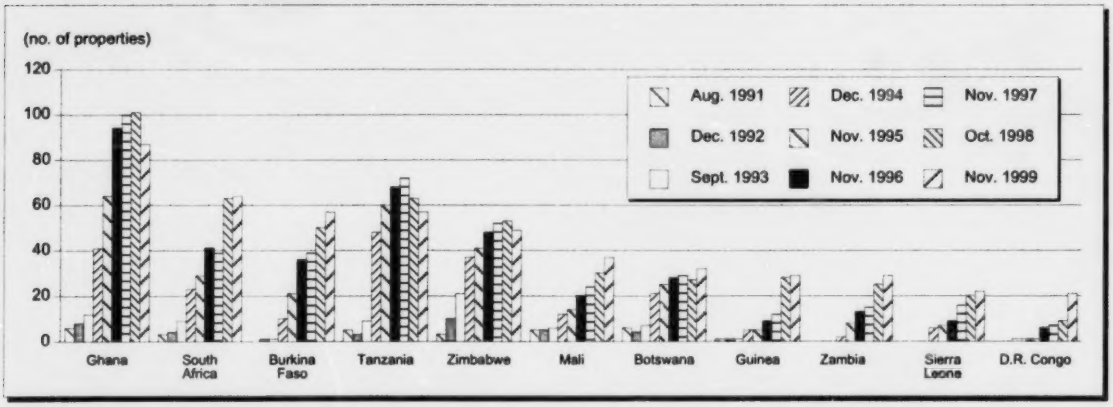
Source: Natural Resources Canada, based on *MIN-MET CANADA* for 1991-97 and InfoMine db for 1998 and 1999, Robertson Info-Data Inc., Vancouver, British Columbia, and used under licence.

Figure 15
Canadian Mineral Property Portfolio in the Former Soviet Union, by Country, 1991-99
Companies of all Sizes Listed on Canadian Stock Exchanges



Source: Natural Resources Canada, based on *MIN-MET CANADA* for 1991-97 and InfoMine db for 1998 and 1999, Robertson Info-Data Inc., Vancouver, British Columbia, and used under licence.

Figure 16
Canadian Mineral Property Portfolio in Africa, 1991-99 – Countries Accounting for 75% of Holdings in 1999
Companies of all Sizes Listed on Canadian Stock Exchanges



Source: Natural Resources Canada, based on *MIN-MET CANADA* for 1991-97 and InfoMine db for 1998 and 1999, Robertson Info-Data Inc., Vancouver, British Columbia, and used under licence.

Russia is by far the country of the FSU where Canadian companies are the most active. In 1999, seven of these companies planned to spend over $10 million in total on exploration there, equivalent to about half of the market. Kinruss planned to spend more than $4 million, mainly at the Kubaka gold mine. Bema Gold Corporation planned to spend almost $4 million at the Julietta gold-silver deposit. The number of properties held in Russia by companies of all sizes listed on Canadian stock exchanges has increased significantly starting in 1996 and now stands at well over 30.

Kazakstan also is of considerable interest to Canadian companies. At the end of 1999, the portfolio of mineral properties held in that country by companies of all sizes listed on Canadian stock exchanges stood at almost 30.

Africa and the Middle East

In 1999, the larger-company mineral exploration market in Africa and the Middle East was valued at almost $490 million (Figure 4), or more than 15% of the $3.2 billion larger-company market worldwide. The larger Canadian-based companies planned to spend almost $70 million in Africa, equivalent to 14% of the market on that continent.[6,7] They reported no exploration programs for the Middle East.

During 1999, Canadian-based companies planned the largest mineral exploration programs in five countries of Africa: SouthernEra Resources Limited planned to spend $4 million on the Camafuca-Camazambo diamond deposit in Angola; Trivalence Mining Corporation planned to spend $14 million on the Aredor Concession, which surrounds its alluvial diamond operation in Guinea; Dia Met Minerals Ltd. planned to spend $3 million exploring for diamonds in the Reguibat Archean Shield in Mauritania; Diamond Fields International Ltd. planned to spend more than $5 million on the Luderitz marine diamond concession in Namibia; and Etruscan Resources Inc. planned to spend $10 million on the Tiawa permit, which hosts the Samira Hill deposit and the adjacent Saoura gold permit.

Between 1992 and 1999, the number of mineral properties held in Africa by companies of all sizes listed on Canadian stock exchanges grew at an average annual compound rate of over 40%. As a result, at the end of 1999, these companies held interests in almost 630 mineral properties in 39 countries on that continent. They held interests in almost 90 properties in Ghana, in over 60 in South Africa, and in 50 or more in each of Burkina Faso, Tanzania and Zimbabwe (Figure 16).

Asia-Pacific

In 1999, the larger-company mineral exploration market in Asia-Pacific was valued at over $900 million (Figure 4), or almost 28% of the $3.2 billion larger-company market worldwide. The exploration market in Asia-Pacific is almost as large as the one in Latin America. The larger Canadian-based companies planned to spend over $55 million in the region, equivalent to roughly 6% of the market there. At the end of 1999, companies of all sizes listed on Canadian stock exchanges held interests in almost 490 mineral properties in the region (Figure 3).

Southeast Asia

In 1999, the larger-company mineral exploration market in Southeast Asia was valued at over $235 million, or 7% of the $3.2 billion larger-company market worldwide. The larger Canadian-based companies planned to spend over $30 million in Southeast Asia, equivalent to about 7% of the market there. They held the dominant share of the market in four countries: Ivanhoe Mines Ltd. planned to spend $0.6 million on exploration for gold near its Monywa copper mine in Myanmar, Madison Enterprises Corp. planned to spend $14 million at the Mt. Kare gold-silver deposit in Papua New Guinea, Ivanhoe planned to spend more than $1 million on gold exploration in Thailand, and Falconbridge Limited planned to spend $0.9 million at the Ban Phuc nickel-copper deposit in Vietnam.

In Indonesia, six of the larger Canadian-based companies planned to spend $10 million in total, equivalent to about 7% of the more than $140 million exploration market in that country. Placer Dome planned to spend more than $4 million evaluating the Awak Mas gold property, the largest Canadian program reported there in 1999.

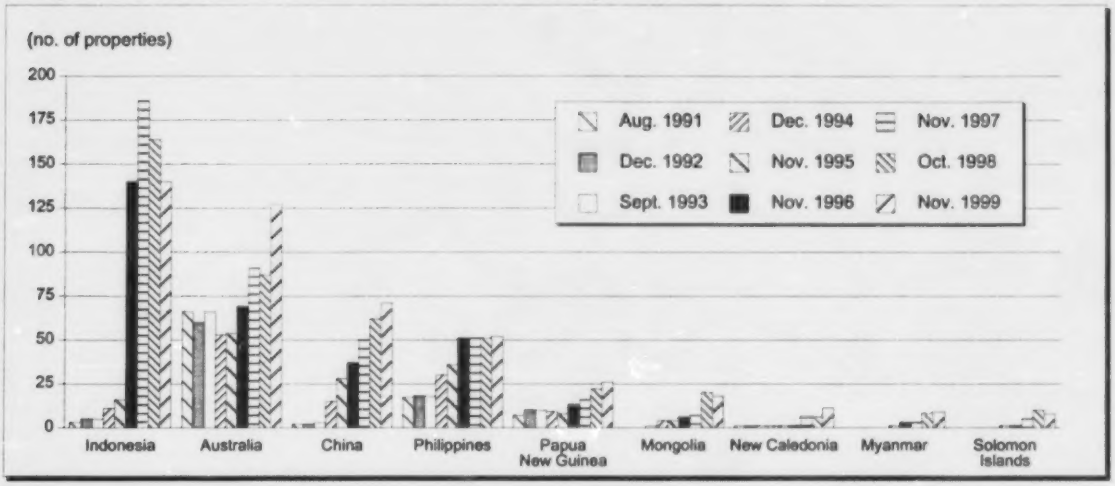
At the end of 1999, companies of all sizes listed on Canadian stock exchanges held over 240 mineral properties in Southeast Asia. They held 140 in Indonesia and more than 50 in the Philippines (Figure 17).

East Asia

In 1999, the larger-company mineral exploration market in east Asia, which includes China, Japan, Mongolia, Taiwan and South Korea, was valued at about $40 million, or 1% of the $3.2 billion larger-company market worldwide. The larger Canadian-based companies planned to spend about $3 million there, equivalent to almost 15% of the market.

Since 1993, there has been considerable Canadian interest in the mineral potential of China. In 1999,

Figure 17
Canadian Mineral Property Portfolio in Asia-Pacific, 1991-99 – Countries Accounting for 95% of Canadian Holdings in 1999
Companies of all Sizes Listed on Canadian Stock Exchanges



Source: Natural Resources Canada, based on *MIN-MET CANADA* for 1991-97 and InfoMine db for 1998 and 1999, Robertson Info-Data Inc., Vancouver, British Columbia, and used under licence.

Southwestern Gold Corporation planned to spend $0.4 million in China, the largest Canadian exploration project reported for that country. In late 1999, companies of all sizes listed on Canadian stock exchanges held interests in over 70 mineral properties in that country (Figure 17).

South Pacific

In 1999, the larger-company mineral exploration market in the South Pacific was valued at almost $615 million, or 19% of the $3.2 billion larger-company market worldwide. Australia accounted for almost all of that market.

The larger Canadian-based companies planned to spend over $20 million in the region, all of it in Australia. These companies hold about 3-4% of the market in that country. Noranda Inc. planned to spend a good portion of its more than $7 million budget for Australia on the Lady Loretta zinc-lead-silver deposit. Placer Dome planned to spend most of its almost $7 million budget for that country looking for copper at the Osborne mine site and for gold at the Kidston mine site.

At the end of 1999, companies of all sizes listed on Canadian stock exchanges held over 150 properties in the South Pacific, of which over 80% were in Australia (Figure 17).

SUMMARY AND OUTLOOK

During 1996, a record amount of equity capital was raised in Canada for mining companies listed on Canadian stock exchanges. As a result, these companies, many of which have no other source of funds because they have no income from production, had the financial resources to conduct, during 1997, more mineral exploration programs worldwide than those of any other nation. Since then, it has been difficult for many companies that only conduct exploration to raise capital. As a result, exploration programs worldwide were cut back significantly in 1998 and again in 1999. In spite of continuing uncertainty, especially for those companies that have no cashflow from production, almost 11% of the world's exploration programs were conducted in Canada in 1999, about the same as in the previous two years. In addition, Canadian-based companies conducted roughly 30% of all of the world's mineral exploration programs.

In 1999, Canadian companies increased their share of the exploration market in the United States to over 50%. Furthermore, they continued to conduct the largest share of exploration programs, not only in Canada, but also in South America, Central America and Europe. Although Canadian companies have diversified their portfolio of mineral projects to well over 100 countries, Canada remains the country where they are, by far, the most active.

Exploration finance markets remain depressed, and a return to the record levels of financing raised in Canada in 1996 for exploration worldwide is not in sight. Many of the smaller companies are inactive because of a lack of funds, and mergers and acquisitions appear to be on the rise. For the foreseeable future, Canadian companies with cash flow from mineral production are likely to continue to dominate mineral exploration, especially in the Americas.

REFERENCES

[1] Most of the information on the larger-company mineral exploration market worldwide is based on *Corporate Exploration Strategies: A Worldwide Analysis*, published annually by the Metals Economics Group, Halifax, Nova Scotia (tel. (902) 429-2880).

[2] Keith Brewer and André Lemieux, *Canada's Global Position in Mining - Canadian Financing of the International Mining Industry*, Metals Finance 4th International Conference, Toronto, May 7-9, 1997, Natural Resources Canada, Ottawa, 53 pp. (tel. (613) 995-4577).

[3] Most of the information for 1991 through 1997 on the mineral property portfolio of companies of all sizes listed on Canadian stock exchanges is derived from MIN-MET CANADA; for 1998 and 1999, it is derived from InfoMine db. These databases are produced by Robertson Info-Data Inc., Vancouver, British Columbia (tel. (604) 683-2037).

[4] For trends in mineral deposit appraisal activity in Canada over the interval 1982-97, and for a list of projects at the deposit appraisal stage in early 1997, see André Lemieux, "Canada's Global Mining Presence," in the 1996 edition of the *Canadian Minerals Yearbook*, Natural Resources Canada, Ottawa, pp. 8.9 and 8.11-8.22.

[5] For a discussion of social issues related to Canadian investment in the mineral industry of developing countries, see Moira Hutchinson, "Beyond Best Practice – The Mining Sector," Chapter 4 of *The Canadian Development Report 1998 - Canadian Corporations and Social Responsibility*, The North-South Institute, 1998, Ottawa, pp. 74-90.

[6] For details on Canadian mineral exploration activity in Africa, see "La Ruée vers l'Afrique" and "Les grands projets miniers" in *Stratégies - Le magazine des gens d'affaires du Canada, de l'Afrique et de la francophonie*, mai-juin 1998, Les Publications du Scorpion, Montréal, pp. 16-23.

[7] For a review of certain economic, political and social aspects of mineral investment in Africa, see Bonnie Campbell, "Liberalisation, deregulation, state promoted investment – Canadian mining interests in Africa," *Journal of Mineral Policy, Business and Environment, Raw Materials Report*, Vol. 13, No. 4, 1998, pp. 14-34.

Notes: (1) Information in this review was current as at early June 2000. (2) This and other reviews, including previous editions, are available on the Internet at http://www.nrcan.gc.ca/mms/cmy/index_e.html.

NOTE TO READERS

The intent of this document is to provide general information and to elicit discussion. It is not intended as a reference, guide or suggestion to be used in trading, investment, or other commercial activities. The author and Natural Resources Canada make no warranty of any kind with respect to the content and accept no liability, either incidental, consequential, financial or otherwise, arising from the use of this document.

TABLE 1. SELECTED PRODUCTION AND ADVANCED MINERAL DEVELOPMENT PROJECTS ABROAD IN WHICH COMPANIES BASED IN CANADA HAVE AN INTEREST

Country	Project	Canadian Participants	Products	Status
Angola	Camafuca	SouthernEra Resources Limited	Diamonds	Feasibility
	Luo	DiamondWorks Ltd.	Diamonds	Production
	Yetwene	DiamondWorks Ltd.	Diamonds	Suspended
Argentina	Alumbrera, Bajo de la	Rio Algom Limited	Copper, gold	Production
	El Pachón	Cambior Inc.	Copper	Feasibility
	Veladero	Barrick Gold Corporation	Gold, silver	Feasibility
Armenia	Ararat	First Dynasty Mines Ltd.	Gold	Production
	Meghradzor	First Dynasty Mines Ltd.	Gold	Suspended
	Zod	First Dynasty Mines Ltd.	Gold	Suspended
Australia	Bounty	Viceroy Resource Corporation	Gold	Production
	Ely	Alcan Aluminium Limited	Aluminum	Feasibility
	Emily Ann	LionOre Mining International Ltd.	Nickel	Feasibility
	Gladstone (refinery)	Alcan Aluminium Limited	Aluminum	Production
	Granny Smith	Placer Dome Inc.	Gold	Production
	Kidston	Placer Dome Inc.	Gold, silver	Production
	Osborne	Placer Dome Inc.	Gold, copper	Production
	Rustler's Roost	William Resources Inc.	Gold	Suspended
	Tarmoola	Teck Corporation	Gold	Production
Bolivia	Ameyapampa	Vista Gold Corp.	Gold	Feasibility
Botswana	Phoenix (Tati)	LionOre Mining International Ltd.	Nickel, copper	Production
	Selkirk (Tati)	LionOre Mining International Ltd.	Nickel, copper	Production
Brazil	Alumar (refinery)	Alcan Aluminium Limited	Aluminum	Production
	Aratu (smelter)	Alcan Aluminium Limited	Aluminum	Production
	Brasília	TVX Gold Inc.	Gold	Production
	Crixás	TVX Gold Inc.	Gold	Production
	Jacobina	William Resources Inc.	Gold	Suspended
	Ouro Preto (refinery)	Alcan Aluminium Limited	Aluminum	Production
	Ouro Preto (smelter)	Alcan Aluminium Limited	Aluminum	Production
	São Bento	Eldorado Gold Corporation	Gold	Production
	Trombetas	Alcan Aluminium Limited	Aluminum	Production
Chile	Altonorte (smelter)	Noranda Inc.	Copper	Production
	Andacollo Copper	Aur Resources Inc.	Copper, gold	Production
	Andacollo Gold	Dayton Mining Corporation	Gold	Production
	Cerro Casale (Aldebaran)	Placer Dome Inc., Bema Gold Corporation, Arizona Star Resource Corp.	Gold, copper, silver	Feasibility
	Cerro Colorado	Rio Algom Limited	Copper	Production
	Collahuasi	Falconbridge Limited	Copper	Production
	El Indio	Barrick Gold Corporation	Copper, gold, silver	Production
	El Toqui	Breakwater Resources Ltd.	Zinc, gold, silver	Production
	Guanaco	Kinross Gold Corporation	Gold, silver	Production
	La Coipa	TVX Gold Inc., Placer Dome Inc.	Gold, silver	Production
	Lobo-Marte	Teck Corporation	Gold	Feasibility
	Lomas Bayas	Boliden Limited	Copper	Production
	Pascua-Lama	Barrick Gold Corporation	Gold, silver	Feasibility
	Quebrada Blanca	Cominco Ltd., Teck Corporation	Copper	Production
	Refugio	Bema Gold Corporation, Kinross Gold Corporation	Gold, silver	Production
	Spence	Rio Algom Limited	Copper	Feasibility
	Zaldivar	Placer Dome Inc.	Copper	Production
China	Crimson Hills	Goldpark China Limited	Gold	Production
	Fortune Mountain	Goldpark China Limited	Gold	Production
	Hucun	Global-Pacific Minerals Inc.	Copper, gold	Production
	Kunshun (refinery)	Inco Limited	Nickel	Production
	Magushan	Copper Mountain Mines Ltd.	Copper	Production
	Qian Chang	Global-Pacific Minerals Inc.	Gold, copper, iron	Production
	Xuanzhou	Copper Mountain Mines Ltd.	Copper	Production
Costa Rica	Bellavista	Wheaton River Minerals Ltd.	Gold	Feasibility
	El Recio (Palo Negro)	Ariel Resources Ltd.	Gold	Production
	Tres Hermanos	Ariel Resources Ltd.	Gold	Suspended
Cuba	Mantua	Northern Orion Explorations Ltd.	Copper	Feasibility
	Moa Bay	Sherritt International Corporation	Nickel, cobalt	Production
Democratic Republic of the Congo	Tenke Fungurume	Tenke Mining Corp.	Copper, cobalt	Feasibility
Dominican Republic	Cerro de Maimon	Falconbridge Limited	Copper	Exploration
	Falcondo	Falconbridge Limited	Nickel	Production
Ghana	Bonte	Ahrokari-Ashanti Gold Mines Inc.	Gold	Production
	GBC	Alcan Aluminium Limited	Aluminum	Production
	Tarkwa	Repadre Capital Corporation	Gold	Production

TABLE 1 (cont'd)

Country	Project	Canadian Participants	Products	Status
Greece	Olympias	TVX Gold Inc.	Gold, zinc, lead, silver	Construction
	Skouries	TVX Gold Inc.	Gold, copper	Feasibility
	Stratoni	TVX Gold Inc.	Lead, zinc, silver	Production
Guinea	Aredor	Trivalence Mining Corporation	Diamonds	Production
	Halco	Alcan Aluminium Limited	Aluminum	Production
Guyana	Omai	Cambior Inc.	Gold	Production
Honduras	El Mochito	Breakwater Resources Ltd.	Zinc, lead, silver	Production
	Vueltas del Rio	Geomaque Explorations Ltd.	Gold	Construction
India	Alupuram (smelter)	Alcan Aluminium Limited	Aluminum	Production
	Belgaum (refinery)	Alcan Aluminium Limited	Aluminum	Production
	Chandgad	Alcan Aluminium Limited	Aluminum	Production
	Hirakud (smelter)	Alcan Aluminium Limited	Aluminum	Production
	Lohardaga	Alcan Aluminium Limited	Aluminum	Production
	Muri (refinery)	Alcan Aluminium Limited	Aluminum	Production
	Uktal	Alcan Aluminium Limited	Aluminum	Feasibility
	Uktal (refinery)	Alcan Aluminium Limited	Aluminum	Feasibility
Indonesia	Cikidang	International Antam Resources Ltd.	Gold, silver	Production
	Halmahera	Weda Bay Minerals Inc.	Nickel, cobalt	Feasibility
	Soroako	Inco Limited	Nickel	Production
Jamaica	Ewarton (refinery)	Alcan Aluminium Limited	Aluminum	Production
	Jamaica	Alcan Aluminium Limited	Aluminum	Production
	Kirkvine (refinery)	Alcan Aluminium Limited	Aluminum	Production
Japan	Tokyo (refinery)	Inco Limited	Nickel	Production
Kazakstan	Central Mukur	Eurasia Gold Corp.	Gold	Production
	Inkai	Cameco Corporation	Uranium	Feasibility
	Myaly	Eurasia Gold Corp.	Gold	Production
Kenya	Kwale	Tiomin Resources Inc.	Titanium sands	Feasibility
Kyrgyzstan	Kumtor	Cameco Corporation	Gold	Production
Mali	Sadiola	IAMGOLD Corporation	Gold	Production
	Yatela	IAMGOLD Corporation	Gold	Feasibility
Mexico	Avino	Avino Silver & Gold Mines Ltd.	Silver, gold, copper	Production
	Cerro San Pedro	Metallica Resources Inc., Cambior Inc.	Gold, silver	Feasibility
	La Colorada	Eldorado Gold Corporation	Gold	Production
	La Colorada	Pan American Silver Corp.	Silver	Feasibility
	Magistral	Queenstake Resources Ltd.	Gold	Feasibility
	Morris	Manhattan Minerals Corp.	Gold	Suspended
	Mulatos	Placer Dome Inc.	Gold	Feasibility
	NYCO	Canadian Pacific Limited	Wollastonite	Production
	Paredones Amarillos	Viceroy Resource Corporation	Gold	Feasibility
	Piedras Verdes	Azco Mining Inc.	Copper	Feasibility
	San Francisco	Geomaque Explorations Ltd.	Gold	Production
	Santa Gertrudis	Campbell Resources Inc.	Gold	Production
	San Martin	First Silver Reserve Inc.	Silver	Production
	San Nicholas	Teck Corporation, Western Copper Holdings Ltd.	Zinc, copper, gold, silver	Feasibility
Myanmar	Letpadaung	Ivanhoe Mines Ltd.	Copper	Feasibility
	Monywa (S&K)	Ivanhoe Mines Ltd.	Copper	Production
New Caledonia	Goro	Inco Limited	Nickel, cobalt	Feasibility
Nicaragua	El Limon	Black Hawk Mining Inc.	Gold	Production
Norway	Nikkelverk (refinery)	Falconbridge Limited	Copper, nickel	Production
	Norzinc (smelter and refinery)	Boliden Limited	Zinc, aluminum	Production
Panama	Cerro Colorado	Tiomin Resources Inc.	Copper, gold	Feasibility
	Cerro Quema	Campbell Resources Inc.	Gold	Construction
	Petaquilla	Inmet Mining Corporation, Teck Corporation, Adrian Resources Ltd.	Copper, gold	Feasibility
Papua New Guinea	Misima	Placer Dome Inc.	Gold, silver	Production
	Ok Tedi	Inmet Mining Corporation	Copper, gold	Production
	Porgera	Placer Dome Inc.	Gold, silver	Production
Peru	Acari	Dynacor Mines Inc.	Gold	Production
	Antamina	Noranda Inc., Rio Algom Limited, Teck Corporation	Copper, zinc, silver, molybdenum	Construction
	Cajamarquilla (refinery)	Cominco Ltd.	Zinc, sulphuric acid	Production
	El Brocal	Cominco Ltd.	Zinc, lead, silver	Production
	Nueva Condor	Oroperu Resources Inc.	Gold	Suspended
	Pierina	Barrick Gold Corporation	Gold, silver	Production
	Quiruvilca	Pan American Silver Corp.	Silver, zinc, lead, copper	Production

TABLE 1 (cont'd)

Country	Project	Canadian Participants	Products	Status
Philippines	Bulawan	Philex Gold Inc.	Gold	Production
	Sibutad	Philex Gold Inc.	Gold	Suspended
Portugal	Aljustrel	EuroZinc Mining Corporation	Zinc, lead, copper, silver	Feasibility
Russia	Dukat	Pan American Silver Corp.	Silver, gold	Feasibility
	Julietta	Bema Gold Corporation	Gold, silver	Construction
	Kubaka	Kinross Gold Corporation	Gold, silver	Production
South Africa	Klipspringer	SouthernEra Resources Limited	Diamonds	Feasibility
	Maranda	Crew Development Corporation	Zinc, copper	Production
	Marsfontein	SouthernEra Resources Limited	Diamonds	Production
	Messina	SouthernEra Resources Limited	Platinum group metals, copper, nickel	Feasibility
	Murchison	Crew Development Corporation	Gold, antimony	Production
	Nabakeep (smelter)	Crew Development Corporation	Copper	Production
	Nigramoep	Crew Development Corporation	Copper	Production
	Palmietgat	Trivalence Mining Corporation	Diamonds	Construction
	Ryedale	Crew Development Corporation	Manganese	Production
	South Deep	Placer Dome Inc.	Gold	Production
	Vergenoeg	Crew Development Corporation	Fluorite	Production
	Wakefield	Crew Development Corporation	Coal	Production
South Korea	Onsan (refinery)	Inco Limited	Nickel	Production
Spain	Carles	Rio Narcea Gold Mines Ltd.	Gold	Construction
	El Valle	Rio Narcea Gold Mines Ltd.	Gold	Production
	Los Frailes (Aprsa)	Boliden Limited	Zinc, copper, lead, silver	Production
Suriname	Gross Rosebel	Cambior Inc.	Gold	Feasibility
Sweden	Aitik	Boliden Limited	Copper, gold, silver	Production
	Åkerberg	Boliden Limited	Zinc, copper, lead, gold, silver	Production
	Garpenberg	Boliden Limited	Zinc, copper, lead, gold, silver	Production
	Kedträsk	Boliden Limited	Zinc, copper, lead, gold, silver	Production
	Kristineberg	Boliden Limited	Zinc, copper, lead, gold, silver	Production
	Laisvall	Boliden Limited	Lead, zinc, silver	Production
	Petiknäs	Boliden Limited	Zinc, copper, lead, gold, silver	Production
	Renström	Boliden Limited	Zinc, copper, lead, gold, silver	Production
	Rönnskär (smelter and refinery)	Boliden Limited	Copper, lead, zinc, gold, silver, platinum group metals, sulphuric acid	Production
Taiwan	Kaohsiung (refinery)	Inco Limited	Nickel	Production
Tajikistan	Aprelevka	Gulf International Minerals Ltd.	Gold	Construction
Tanzania	Bulyanhulu	Barrick Gold Corporation	Gold	Construction
	Kabanga/Kagera	Barrick Gold Corporation	Nickel, cobalt	Feasibility
Thailand	Somboon	Asia Pacific Resources Ltd.	Potash	Feasibility
Tunisia	Bougrine	Breakwater Resources Ltd.	Zinc, lead	Production
Turkey	Agi Dagi	Cominco Ltd.	Gold	Exploration
	Çayeli	Inmet Mining Corporation	Copper, zinc, gold, silver	Production
	Cerattepe	Cominco Ltd.	Copper, gold, silver	Feasibility
	Kaymaz	Eldorado Gold Corporation	Gold	Feasibility
	Kücükdere	Eldorado Gold Corporation	Gold	Feasibility
United Kingdom	Acton (refinery)	Inco Limited	Platinum group metals	Production
	Burntisland (refinery)	Alcan Aluminium Limited	Aluminum	Production
	Clydach (refinery)	Inco Limited	Nickel, cobalt	Production
	Kinlochleven (smelter)	Alcan Aluminium Limited	Aluminum	Production
	Lochaber (smelter)	Alcan Aluminium Limited	Aluminum	Production
	Lynemouth (smelter)	Alcan Aluminium Limited	Aluminum	Production
United States	Bald Mountain	Placer Dome Inc.	Gold	Production
	Betze-Post (Goldstrike)	Barrick Gold Corporation	Gold	Production
	Carlota	Cambior Inc.	Copper	Construction
	Castle Mountain	Viceroy Resource Corporation	Gold	Production
	Copper Creek	AMT International Mining Corporation	Copper, molybdenum	Feasibility
	Cortez (Pipeline)	Placer Dome Inc.	Gold, silver	Production
	Crow Butte	Cameco Corporation	Uranium	Production
	DeLamar	Kinross Gold Corporation	Gold, silver	Suspended

TABLE 1 (cont'd)

Country	Project	Canadian Participants	Products	Status
	Denton-Rawhide	Kinross Gold Corporation, Dayton Mining Corporation	Gold, silver	Production
	Donlin Creek	Placer Dome Inc.	Gold	Exploration
	Eveleth	Stelco Inc.	Iron	Production
	Fort Knox	Kinross Gold Corporation	Gold	Production
	Gas Hills	Cameco Corporation	Uranium	Feasibility
	Getchell and Turquoise Ridge	Placer Dome Inc.	Gold	Feasibility
	Golden Sunlight	Placer Dome Inc.	Gold	Production
	Hayden Hill	Kinross Gold Corporation	Gold, silver	Production
	Hibbing	Stelco Inc.	Iron	Production
	Highland	Cameco Corporation	Uranium	Production
	Hycroft	Vista Gold Corp.	Gold, silver	Suspended
	Jamboree	Stelco Inc.	Coal	Production
	Ken Snyder	Franco-Nevada Mining Corporation Limited	Gold	Production
	Lisbon Valley	Summo Minerals Corporation	Copper	Feasibility
	Meikle (Goldstrike)	Barrick Gold Corporation	Gold	Production
	Montanore	Noranda Inc.	Copper, silver	Feasibility
	New Madrid (smelter)	Noranda Inc.	Aluminum	Production
	Nicolet (Crandon)	Rio Algom Limited	Zinc, copper	Permitting
	Pend Oreille	Cominco Ltd.	Zinc, lead	Feasibility
	Rasmussen Ridge	Agrium Inc.	Phosphate	Production
	Red Dog	Cominco Ltd.	Zinc, lead, silver	Production
	Rodeo (Goldstrike)	Barrick Gold Corporation	Gold	Construction
	Sebree (smelter)	Alcan Aluminium Limited	Aluminum	Production
	Smith Ranch	Rio Algom Limited	Uranium	Production
	Soledad Mountain	Golden Queen Mining Co. Ltd.	Gold, silver	Feasibility
	Tilden	Algoma Steel Inc., Stelco Inc.	Iron	Production
	Wharf	Goldcorp Inc.	Gold	Production
Uruguay	San Gregorio	Crystallex International Corporation	Gold	Production
Venezuela	Albino	Crystallex International Corporation	Gold	Suspended
	Las Cristinas	Placer Dome Inc.	Gold, copper	Construction
	Loma de Niquel	iTech Capital Corp.	Nickel	Construction
	Tomi	Bolivar Goldfields Ltd.	Gold	Production
Zambia	Bwana Mkubwa	First Quantum Minerals Ltd.	Copper, sulphuric acid	Production
	Chibuluma West	Crew Development Corporation	Copper	Production
	Mufulira	First Quantum Minerals Ltd.	Copper	Production
	Nkana	First Quantum Minerals Ltd.	Copper, cobalt	Production
Zimbabwe	Blanket	Kinross Gold Corporation	Gold	Production
	Blue Rock	Conquest Resources Limited	Gold	Production
	Connemara	First Quantum Minerals Ltd.	Gold	Production
	Jena	Consolidated Trillion Resources Ltd.	Gold	Production
	Shamrock	Conquest Resources Limited	Gold	Production

Source: Natural Resources Canada, based on company reports available in early June 2000.
Note: Canadian companies have interests in hundreds of other projects around the globe, mainly at the exploration stage of the mineral development process.

Statistical Report

This statistical summary of the Canadian mineral industry has been compiled by staff of the Minerals and Mining Statistics Division, Minerals and Metals Sector, Natural Resources Canada (NRCan), under the general direction of Yvan Gauthier, Director.

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Statistics contained in this summary are obtained from a variety of sources. Principal sources include the statistical survey programs of NRCan, Statistics Canada, and Labour Canada. The statistical survey program of the Minerals and Mining Statistics Division of NRCan is conducted jointly with the provincial governments and Statistics Canada in order to minimize the reporting burden on the mineral industry. The cooperation of the companies providing information is greatly appreciated.

*(**Note to Reader:** We continue to review the tables of this Report in order to establish the requirements of users. We would appreciate your feedback on which tables are important to you. Please contact Laurie Morrison at tel. (613) 992-6767 or e-mail lmorriso@nrcan.gc.ca to provide your input.)*

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TABLE 1. MINERAL PRODUCTION OF CANADA, 1996-99P

	Unit	1996		1997		1998		1999P	
	(000)	(Quantity)	($000)	(Quantity)	($000)	(Quantity)	($000)	(Quantity)	($000)
METALS									
Antimony	kg	1 380	6 084	529	1 610	359	845	475	986
Bismuth	kg	150	1 598	196	1 956	186	2 078	264	2 941
Cadmium	kg	1 540	5 732	1 272	1 991	1 179	1 104	1 212	704
Calcium	kg	x	x	x	x	x	x	x	x
Cesium, pollucite	kg	x	x	x	x	x	x	x	x
Cobalt	kg	2 150	164 918	2 168	154 408	2 262	158 643	2 015	114 013
Columbium (niobium)	kg	x	x	2 253	x	2 194	x	2 250	x
Copper	kg	652 499	2 059 285	647 779	2 050 869	690 762	1 695 820	580 036	1 361 344
Gold	g	164 660	2 799 547	171 479	2 527 429	164 773	2 312 583	157 790	2 132 534
Ilmenite	t	x	x	x	x	x	x	x	x
Indium	g	x	x	x	x	x	x	x	x
Iron ore	t	34 400	1 321 727	38 928	1 571 741	38 586	1 646 419	33 004	1 419 693
Iron remelt	t	x	x	x	x	x	x	x	x
Lead	kg	241 751	254 564	170 847	147 612	150 019	117 615	158 102	117 389
Lithium	kg	x	x	x	x	x	x	x	x
Magnesium	kg	x	x	x	x	x	x	x	x
Molybdenum	kg	8 789	100 196	7 594	87 582	8 099	98 752	6 293	75 695
Nickel	kg	182 404	1 920 348	180 624	1 775 898	197 947	1 411 167	177 229	1 562 986
Platinum group	g	13 934	141 620	11 836	134 242	15 588	236 007	14 012	250 947
Selenium	kg	694	7 140	592	5 045	398	2 960	438	3 264
Silver	kg	1 243	282 510	1 194	260 024	1 140	301 089	1 173	296 547
Tantalum	kg	67	7 625	60	7 230	70	9 863	64	9 304
Tellurium	kg	59	1 744	59	831	62	742	67	795
Uranium	kg	11 348	620 880	11 127	553 900	9 992	508 038	9 892	502 482
Zinc	kg	1 162 720	1 625 482	1 026 864	1 870 948	991 584	1 507 208	980 099	1 533 278
Total metals			11 697 468		11 549 178		10 450 185		9 808 870
NONMETALS									
Asbestos	t	506	256 722	420	214 910	321	167 386	345	162 450
Barite	t	58	6 498	84	7 119	86	9 142	70	6 583
Diamonds	carats	–	–	–	–	203	40 755	2 400	581 721
Gemstones	kg	294	684	407	1 482	159	631	144	482
Graphite	t	x	x	x	x	x	x	x	x
Gypsum	t	8 202	85 415	8 628	95 263	8 307	94 349	8 935	101 207
Magnesitic dolomite	t	x	x	x	x	x	x	x	x
Marl	t	x	x	x	x	x	x	x	x
Mica	t	x	x	x	x	x	x	x	x
Nepheline syenite	t	606	46 690	648	51 319	636	53 405	693	57 979
Peat	t	901	141 019	1 054	146 404	1 125	166 542	1 216	188 767
Potash	t	8 120	1 277 860	9 235	1 528 341	8 884	1 747 985	8 345	1 775 834
Potassium sulphate	t	x	x	x	x	x	x	x	x
Pumice	t	x	x	x	x	x	x	x	x
Quartz	t	1 558	36 193	1 690	40 198	1 771	41 849	1 657	41 578
Salt	t	12 248	359 818	13 497	405 509	13 034	390 677	12 643	391 487
Serpentine	t	x	x	x	x	x	x	x	x
Soapstone, talc and pyrophyllite	t	77	15 151	72	14 908	72	15 545	77	19 068
Sodium sulphate	t	323	30 964	285	29 040	258	27 080	245	23 441
Sulphur, elemental	t	9 450	83 805	8 272	84 129	8 404	62 109	8 792	80 716
Sulphur in smelter gas	t	789	57 765	800	59 462	836	55 451	846	63 097
Titanium dioxide	t	x	x	x	x	x	x	x	x
Tremolite	t	x	x	x	x	x	x	x	x
Zeolite	t	x	x	x	x	x	x	x	x
Total nonmetals			2 765 775		3 026 971		3 425 474		4 007 836
MINERAL FUELS									
Coal	t	75 860	1 936 030	78 670	1 920 150	75 360	1 764 770	72 310	1 484 390
Natural gas	000 m^3	153 578	8 734 860	156 171	10 719 153	160 515	10 893 493	163 384	13 696 400
Natural gas by-products	m^3	26 657	2 838 702	26 427	2 599 598	26 666	1 763 072	26 075	2 347 254
Crude oil and equivalent	m^3	117 620	19 071 725	123 827	17 837 834	128 401	12 940 149	122 448	18 894 009
Total fuels			32 581 337		33 076 735		27 361 484		36 422 053
STRUCTURAL MATERIALS									
Clay products	$	x	110 218	x	136 324	x	135 814	x	165 713
Cement	t	11 587	964 380	11 736	1 062 708	12 124	1 147 757	12 604	1 232 058
Lime	t	2 402	202 579	2 477	213 038	2 461	214 966	2 536	235 621
Sand and gravel	t	213 831	772 590	225 494	829 190	225 338	875 226	218 458	861 659
Stone	t	92 331	592 547	99 265	644 162	108 924	727 947	104 026	732 369
Total structural materials			2 642 314		2 885 422		3 101 710		3 227 419
Total all minerals			49 686 894		50 538 306		44 338 853		53 465 978

Sources: Natural Resources Canada; Statistics Canada.
– Nil; P Preliminary; x Confidential.
Notes: Numbers may not add to totals due to rounding. Confidential values are included in totals.

TABLE 2. CANADA, VALUE OF MINERAL PRODUCTION, PER CAPITA VALUE OF MINERAL PRODUCTION, AND POPULATION, 1973-99

Year	Value of Mineral Production					Per Capita Value of Mineral Production	Population of Canada
	Metals	Nonmetals	Structural Materials	Fuels	Total		
	($ millions)					($)	(000)
1973	3 947	615	678	3 227	8 467	375.31	22 560
1974	4 934	896	835	5 202	11 867	518.78	22 875
1975	5 022	939	959	6 653	13 574	584.86	23 209
1976	5 344	1 166	1 107	8 109	15 726	668.68	23 518
1977	6 031	1 363	1 249	9 873	18 516	778.11	23 796
1978	5 746	1 481	1 508	11 578	20 313	845.11	24 036
1979	8 006	1 870	1 646	15 117	26 638	1 097.25	24 277
1980	9 777	2 531	1 624	17 944	31 875	1 296.10	24 593
1981	8 841	2 714	1 777	19 046	32 378	1 300.32	24 900
1982	6 953	2 105	1 736	23 038	33 831	1 342.39	25 202
1983	7 528	2 021	1 836	27 154	38 539	1 513.95	25 456
1984	8 897	2 538	1 955	30 399	43 789	1 703.72	25 702
1985	8 745	2 736	2 128	31 120	44 730	1 724.23	25 942
1986	8 819	2 523	2 341	18 763	32 446	1 238.21	26 204
1987	10 962	2 381	2 744	20 274	36 361	1 369.53	26 550
1988	13 608	2 757	2 817	17 773	36 955	1 374.05	26 895
1989	13 982	2 706	2 860	19 785	39 333	1 436.61	27 379
1990	12 500	2 529	2 760	22 990	40 778	1 467.31	27 791
1991	10 462	2 407	2 376	19 945	35 190	1 251.42	28 120
1992	10 210	2 239	2 234	20 901	35 584	1 246.72	28 542
1993	8 871	2 147	2 312	23 214	36 545	1 262.48	28 947
1994	9 750	2 648	2 544	26 243	41 185	1 418.41	29 036
1995	12 173	2 906	2 530	25 759	43 367	1 477.38	29 354
1996	11 697	2 766	2 642	32 581	49 687	1 674.54	29 672
1997	11 549	3 027	2 885	33 077	50 538	1 685.33	29 987
1998	10 450	3 425	3 102	27 361	44 339	1 465.90	30 247
1999p	9 809	4 008	3 227	36 422	53 466	1 753.50	30 491

Sources: Natural Resources Canada; Statistics Canada.
p Preliminary.
Notes: Beginning in 1986, bentonite, diatomite and sodium antimonate are reported in industrial minerals. Numbers may not add to totals due to rounding.

TABLE 3. CANADA, VALUE OF MINERAL PRODUCTION BY PROVINCE, TERRITORY AND MINERAL CLASS, 1999P

Province/Territory	Metals		Nonmetals		Structural Materials		Mineral Fuels		Total	
	($000)	(% of total)	($000)	(% of total)	($000)	(% of total)	($000)	(% of total)	($000)	(% of total)
Newfoundland	902 059	9.20	1 292	0.03	45 379	1.41	979 591	2.69	1 928 321	3.61
Prince Edward Island	–	–	3 541	0.09	1 358	0.04	–	–	4 899	0.01
Nova Scotia	–	–	126 135	3.15	93 701	2.90	165 584	0.45	385 420	0.72
New Brunswick	597 934	6.10	191 994	4.79	45 989	1.42	21 600	0.06	857 517	1.60
Quebec	2 187 717	22.30	770 458	19.22	568 150	17.60	–	–	3 526 325	6.60
Ontario	3 205 152	32.68	386 234	9.64	1 443 027	44.71	86 102	0.24	5 120 515	9.58
Manitoba	713 641	7.28	22 901	0.57	58 652	1.82	97 508	0.27	892 703	1.67
Saskatchewan	526 431	5.37	1 740 278	43.42	41 800	1.30	3 711 837	10.19	6 020 346	11.26
Alberta	145	. . .	133 594	3.33	509 752	15.79	28 356 207	77.85	28 999 698	54.24
British Columbia	1 222 318	12.46	49 688	1.24	410 742	12.73	2 745 159	7.54	4 427 908	8.28
Yukon	61 756	0.63	–	–	2 094	0.06	27 108	0.07	90 958	0.17
Northwest Territories	41 613	0.42	581 721	14.51	6 774	0.21	231 357	0.64	861 464	1.61
Nunavut	349 904	3.57	–	–	–	0.00	–	–	349 904	0.65
Total	9 808 670	100.0	4 007 836	100.00	3 227 419	100.0	36 422 053	100.0	53 465 978	100.0

Sources: Natural Resources Canada; Statistics Canada.
– Nil; . . . Amount too small to be expressed; P Preliminary.

TABLE 4. CANADA, VALUE OF MINERAL PRODUCTION BY PROVINCE, TERRITORY AND MINERAL CLASS, 1998

Province/Territory	Metals		Nonmetals		Structural Materials		Mineral Fuels		Total	
	($000)	(% of total)	($000)	(% of total)	($000)	(% of total)	($000)	(% of total)	($000)	(% of total)
Newfoundland	1 046 063	10.01	1 258	0.04	47 213	1.52	444 962	1.63	1 539 496	3.47
Prince Edward Island	–	–	5 601	0.16	898	0.03	–	–	6 499	0.01
Nova Scotia	–	–	116 883	3.41	88 459	2.85	247 685	0.91	453 027	1.02
New Brunswick	609 944	5.84	188 891	5.51	41 308	1.33	22 850	0.08	862 993	1.95
Quebec	2 200 802	21.06	789 627	23.05	569 536	18.35	–	–	3 559 965	8.03
Ontario	3 281 933	31.40	375 446	10.96	1 341 377	43.25	66 639	0.24	5 065 395	11.42
Manitoba	808 445	7.74	19 917	0.58	64 796	2.09	73 912	0.27	967 070	2.18
Saskatchewan	551 444	5.28	1 707 945	49.86	40 956	1.32	2 495 903	9.12	4 796 247	10.82
Alberta	118	. . .	129 783	3.79	494 051	15.93	21 262 403	77.71	21 886 355	49.36
British Columbia	1 483 721	14.20	49 349	1.44	404 224	13.03	2 528 943	9.24	4 366 237	10.07
Yukon	114 491	1.10	–	–	2 123	0.07	33 722	0.12	150 336	0.34
Northwest Territories	353 224	3.38	40 775	1.19	6 769	0.22	184 465	0.67	585 233	1.32
Total	10 450 185	100.0	3 425 475	100.0	3 101 710	100.0	27 361 484	100.0	44 338 853	100.0

Sources: Natural Resources Canada; Statistics Canada.
– Nil; . . . Amount too small to be expressed.
Note: Numbers may not add to totals due to rounding.

TABLE 5. CANADA, VALUE OF MINERAL PRODUCTION BY PROVINCE AND TERRITORY, 1992-99

Province/Territory	1992	1993	1994	1995	1996	1997	1998	1999P
	($ millions)							
Alberta	17 056	18 925	21 119	20 676	26 218	26 671	21 886	29 000
Ontario	4 776	4 534	4 921	5 825	5 718	5 615	5 065	5 121
Saskatchewan	3 158	3 238	4 225	4 580	5 331	5 508	4 796	6 020
British Columbia	3 500	3 538	4 066	4 501	4 340	4 681	4 466	4 428
Quebec	2 694	2 692	2 956	3 338	3 415	3 437	3 560	3 526
Manitoba	1 082	862	820	1 022	1 002	1 126	967	893
Newfoundland	706	699	837	878	906	1 038	1 539	1 928
New Brunswick	910	772	862	1 021	955	953	863	858
Northwest Territories	681	585	680	766	780	799	585	861
Nova Scotia	523	554	608	560	593	481	453	385
Nunavut	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	350
Yukon	496	141	86	196	425	225	150	91
Prince Edward Island	2	4	3	4	4	3	6	5
Total	35 584	36 545	41 185	43 367	49 687	50 538	44 339	53 466

Sources: Natural Resources Canada; Statistics Canada.
n.a. Not applicable; P Preliminary.
Note: Numbers may not add to totals due to rounding.

TABLE 6. CANADA, PRODUCTION OF LEADING MINERALS, 1998 AND 1999p

		Volume		Percent Change	Value		Percent Change
		1998	1999p	1999/1998	1998	1999p	1999/1998
		(000 tonnes except where noted)			($ millions)		
METALS							
Gold	kg	164 773	157 790	–4.2	2 312.6	2 132.5	–7.8
Nickel		198	177	–10.5	1 411.2	1 563.0	10.8
Zinc		992	960	–3.2	1 507.2	1 533.3	1.7
Iron ore		36 586	33 004	–9.8	1 646.4	1 419.7	–13.8
Copper		691	580	–16.0	1 695.8	1 361.3	–19.7
Uranium	tU	9 992	9 892	–1.0	508.0	502.5	–1.1
Silver	t	1 140	1 173	2.9	301.1	296.5	–1.5
Platinum group	kg	15 588	14 012	–10.1	236.0	250.9	6.3
Lead		150	156	4.1	117.6	117.4	–0.2
Cobalt	t	2 262	2 015	–10.9	158.6	114.0	–28.1
Molybdenum	t	8 099	6 293	–22.3	98.8	75.7	–23.3
NONMETALS							
Potash (K_2O equivalent)		8 884	8 345	–6.1	1 748.0	1 775.8	1.6
Diamonds	000 carats	203	2 400	1 082.3	40.8	581.7	1 326.7
Salt		13 034	12 643	–3.0	390.7	391.5	0.2
Peat		1 125	1 216	8.1	166.5	168.8	1.3
Asbestos		321	345	7.5	167.4	162.5	–2.9
Gypsum		8 307	8 935	7.6	94.3	101.2	7.3
Sulphur, elemental		8 404	8 792	4.6	62.1	80.7	30.0
Sulphur in smelter gas		836	846	1.2	55.5	63.1	13.8
STRUCTURAL MATERIALS							
Cement		12 124	12 604	4.0	1 147.8	1 232.1	7.3
Sand and gravel		225 338	218 458	–3.1	875.2	861.7	–1.6
Stone		108 924	104 026	–4.5	727.9	732.4	0.6
Lime		2 461	2 538	3.1	215.0	235.6	9.6
Clay products		. .	. .	. .	135.8	165.7	22.0
MINERAL FUELS							
Petroleum crude	000 m^3	128 401	122 448	–4.6	12 940.1	18 894.0	46.0
Natural gas	million m^3	160 515	163 384	1.8	10 893.5	13 696.4	25.7
Natural gas by-products	000 m^3	26 666	26 075	–2.2	1 763.1	2 347.3	33.1
Coal		75 360	72 310	–4.0	1 764.8	1 484.4	–15.9

Sources: Natural Resources Canada; Statistics Canada, *Canada's Mineral Production, Preliminary Estimates*, cat. no. 26-202-XIB.
. . Not available; p Preliminary.
Note: Numbers have been rounded.

TABLE 7. PRODUCTION OF LEADING MINERALS, BY PROVINCE AND TERRITORY IN CANADA, 1999p

	Unit	Nfld.	P.E.I.	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskat-chewan	Alberta	British Columbia	Yukon	N.W.T.	Nunavut	Total Canada
	(000)														
Crude oil and equivalent	m^3	5 762	–	394	–	–	247	590	21 465	89 494	2 854	–	1 643	–	122 448
	$	979 591	–	64 524	–	–	42 113	97 508	3 032 083	14 004 867	453 682	–	219 641	–	18 894 009
Natural gas	000 m^3	–	–	–	–	–	304	–	6 033	135 702	20 710	489	146	–	163 384
	$	–	–	–	–	–	43 989	–	545 978	11 632 596	1 435 013	27 106	11 716	–	13 696 400
Natural gas by-products	m^3	–	–	–	–	–	–	–	63	25 510	502	–	–	–	26 075
	$	–	–	–	–	–	–	–	6 496	2 289 074	51 684	–	–	–	2 347 254
Gold	g	1 400	–	–	220	37 492	76 221	8 207	1 703	11	24 933	4 537	3 067	–	157 790
	$	18 916	–	–	2 978	506 704	1 030 128	110 914	23 010	145	336 968	61 316	41 455	–	2 132 534
Potash (K_2O equivalent)	t	–	–	–	x	–	–	–	x	–	–	–	–	–	6 345
	$	–	–	–	x	–	–	–	x	–	–	–	–	–	1 775 834
Nickel	kg	–	–	–	–	19 943	126 514	30 773	–	–	–	–	–	–	177 229
	$	–	–	–	–	175 877	1 115 726	271 383	–	–	–	–	–	–	1 562 986
Zinc	kg	–	–	–	285 698	176 380	87 708	88 256	308	–	125 490	–	–	196 258	960 099
	$	–	–	–	456 260	281 679	140 070	140 944	493	–	200 407	–	–	313 425	1 533 278
Coal	t	–	–	1 560	260	–	–	–	11 590	33 970	24 930	–	–	–	72 310
	$	–	–	101 060	21 600	–	–	–	127 280	429 670	804 780	–	–	–	1 484 390
Iron ore	t	18 540	–	–	–	14 375	–	–	–	–	89	–	–	–	33 004
	$	882 991	–	–	–	x	–	–	–	–	x	–	–	–	1 419 693
Copper	kg	–	–	–	10 562	125 163	209 580	52 020	168	–	182 543	–	–	–	580 036
	$	–	–	–	24 788	293 758	491 884	122 091	394	–	428 429	–	–	–	1 361 344
Cement	t	x	–	x	–	2 758	5 530	–	–	x	1 679	–	–	–	12 604
	$	x	–	x	–	229 897	510 532	–	–	x	171 637	–	–	–	1 232 058
Sand and gravel	t	3 728	260	2 409	4 661	23 940	86 705	9 627	12 320	40 171	33 558	621	458	–	218 458
	$	17 904	1 358	10 820	x	64 554	321 663	x	x	196 066	163 398	2 094	2 175	–	861 659
Stone	t	2 516	–	7 005	3 667	29 791	49 602	4 547	–	488	6 156	–	255	–	104 026
	$	16 553	–	42 094	22 582	211 029	360 238	22 503	–	4 865	47 906	–	4 599	–	732 369
Diamonds	carats	–	–	–	–	–	–	–	–	–	–	–	2 400	–	2 400
	$	–	–	–	–	–	–	–	–	–	–	–	581 721	–	581 721
Uranium	kg	–	–	–	–	–	–	–	9 892	–	–	–	–	–	9 892
	$	–	–	–	–	–	–	–	502 482	–	–	–	–	–	502 482
Titanium dioxide	t	–	–	–	–	x	–	–	–	–	–	–	–	–	x
	$	–	–	–	–	x	–	–	–	–	–	–	–	–	x
Salt	t	–	–	x	x	x	7 787	–	727	1 259	–	–	–	–	12 643
	$	–	–	x	x	x	246 231	–	30 510	22 623	–	–	–	–	391 487
Silver	kg	1	–	–	220	186	216	35	0	–	497	2	1	16	1 173
	$	152	–	–	55 733	47 048	54 552	8 801	53	–	125 570	440	158	4 040	296 547
Iron, remelt	t	–	–	–	–	x	–	–	–	–	–	–	–	–	x
	$	–	–	–	–	x	–	–	–	–	–	–	–	–	x
Platinum group	g	–	–	–	–	–	x	x	–	–	–	–	–	–	14 012
	$	–	–	–	–	–	x	x	–	–	–	–	–	–	250 947
Lime	t	–	–	–	x	x	1 384	x	–	x	x	–	–	–	2 538
	$	–	–	–	x	x	121 913	x	–	x	x	–	–	–	235 621
Peat	t	2	43	x	444	372	–	x	x	178	–	–	–	–	1 216
	$	417	3 541	x	57 558	49 864	–	x	x	26 511	–	–	–	–	168 767
Clay products	$	x	–	x	–	x	128 682	–	x	x	x	–	–	–	165 713
Asbestos	t	–	–	–	–	345	–	–	–	–	–	–	–	–	345
	$	–	–	–	–	162 450	–	–	–	–	–	–	–	–	162 450
Lead	kg	–	–	–	72 925	–	–	–	–	–	40 041	–	–	43 136	156 102
	$	–	–	–	54 839	–	–	–	–	–	30 111	–	–	32 438	117 389
Total leading minerals	$	1 927 448	4 899	302 761	845 872	3 384 807	4 840 957	848 611	5 982 233	28 915 237	4 279 430	90 958	861 464	349 904	52 634 580
Total all minerals	$	1 928 321	4 899	385 420	857 517	3 526 325	5 120 515	892 703	6 020 348	28 999 606	4 427 908	90 958	861 464	349 904	53 465 978
Leading minerals as a percentage of all minerals		100.0	100.0	78.6	98.6	96.0	94.5	95.1	99.4	99.7	96.6	100.0	100.0	100.0	98.4

Sources: Natural Resources Canada; Statistics Canada.
– Nil; p Preliminary; x Confidential.
Notes: Certain minerals are not included in leading minerals due to confidentiality constraints. Confidential values are included in "Total all minerals." Numbers may not add to totals due to rounding.

TABLE 8. CANADA'S WORLD ROLE AS A PRODUCER OF CERTAIN IMPORTANT MINERALS, 1998p

		World	Rank of Five Leading Countries				
			1	2	3	4	5
Potash (K_2O equivalent) (mine production)	000 t	25 881	**Canada**	C.I.S.	Germany	Israel	United States
			9 201	6 915	3 585	1 670	1 300
	% of world total		**35.6**	26.7	13.9	6.5	5.0
Uranium (U concentrates) (mine production)	t	33 969	**Canada**	Australia	Niger	Namibia	Russia
			11 041a	4 901	3 713	2 778	2 000
	% of world total		**32.5**	14.4	10.9	8.2	5.9
Nickel (mine production)	000 t	1 113	Russia	**Canada**	Australia	New Caledonia	Indonesia
			235	**208**	144	125	74
	% of world total		21.1	**18.7**	12.9	11.3	6.7
Zinc (mine production)	000 t	7 644	China	**Canada**	Australia	Peru	United States
			1 273	**1 065**	1 059	869	755
	% of world total		16.7	**13.9**	13.9	11.4	9.9
Cadmium (refined production)	t	19 636	Japan	**Canada**	China	United States	Belgium
			2 336	**2 067**	2 000	1878	1 318
	% of world total		11.9	**10.5**	10.2	9.6	6.7
Asbestos (mine production)	000 t	1 925	C.I.S.	China	**Canada**	Brazil	Zimbabwe
			630	440	**302**	198	130
	% of world total		32.7	22.9	**15.7**	10.3	6.8
Titanium concentrates (ilmenite, rutile, slag)	000 t	7 126e	Australia	South Africa	**Canada**	United States	Norway
			2 644	1 220	**950**	601	590
	% of world total		37.1	17.1	**13.3**	11.8	8.3
Aluminum (primary metal)	000 t	22 579	United States	C.I.S.	**Canada**	China	Australia
			3 713	3 005	**2 374**	2 285	1 626
	% of world total		16.4	13.3	**10.5**	10.1	7.2
Platinum group metals (mine production)	kg	289 107	South Africa	Russia	**Canada**	United States	Japan
			188 000	67 500	**15 287**	13 840	2 550
	% of world total		65.0	23.3	**5.3**	4.8	0.9
Salt (mine production)	000 t	185 996	United States	China	Germany	**Canada**	India
			41 200	30 800	15 700	**13 296**	9 500
	% of world total		22.2	16.6	8.4	**7.1**	5.1
Gold (mine production)	t	2 443	South Africa	United States	Australia	**Canada**	China
			464	366	309	**166**	158
	% of world total		19.0	15.0	12.6	**6.8**	6.5
Molybdenum (Mo content) (mine production)	t	135 478	United States	China	Chile	**Canada**	Mexico
			53 300	30 000	25 298	**8 469**	5949
	% of world total		39.3	22.1	18.7	**6.3**	4.4
Copper (mine production)	000 t	12 183	Chile	United States	Indonesia	**Canada**	Australia
			3 687	1 859	809	**705**	607
	% of world total		30.3	15.3	6.6	**5.8**	5.0
Gypsum (mine production)	000 t	107 867	United States	Thailand	China	Iran	**Canada**
			19 000	9 000	9000	9 000	**8 967**
	% of world total		17.6	8.3	8.3	8.3	**8.3**
Cobalt (shipments)	t	25 154	Zambia	Congo, D.R.	Russia	Cuba	**Canada**
			7 000	4 490	4 000	2 200	**2 015**
	% of world total		27.8	17.9	15.9	8.7	**8.0**
Lead (mine production)	000 t	3 117	China	Australia	United States	Peru	**Canada**
			710	618	491	257	**189**
	% of world total		22.3	19.5	15.5	8.1	**5.9**

Sources: Natural Resources Canada, from *World Nonferrous Metal Statistics* and the *Canadian Minerals Yearbook*; U.S. Geological Survey.
C.I.S.: Commonwealth of Independent States; e Estimated; p Preliminary.
a Includes uranium (tU) recovered by Elliot Lake producers from refinery/conversion facility wastes.

TABLE 9. CANADA, GROSS DOMESTIC PRODUCT OF INDUSTRIAL PRODUCTION, MINING AND MINERAL MANUFACTURING AT FACTOR COST AT 1992 PRICES, 1992-99

	1992	1993	1994	1995	1996	1997	1998	1999
	($ millions)							
Total industrial production[1]	141 603	148 010	157 555	164 705	167 496	176 658	180 797	188 910
Total mining	23 054	23 942	25 067	25 932	26 398	27 593	27 502	26 721
METALS								
Gold mines	1 203	1 162	1 061	1 048	1 154	1 221	1 165	1 099
Other metal mines	3 358	3 077	2 745	2 797	2 814	2 599	2 666	2 410
Iron mines	433	421	499	501	533	580	567	478
MINERAL FUELS								
Crude oil and natural gas	14 001	14 708	15 412	15 881	16 060	16 532	17 002	16 590
NONMETALS								
Asbestos	110	101	102	n.a.	n.a.	n.a.	n.a.	n.a.
Miscellaneous nonmetals	200	223	264	n.a.	n.a.	n.a.	n.a.	n.a.
Potash	706	655	792	845	743	835	851	778
Salt	147	142	167	142	162	180	174	164
Coal	797	929	966	1 017	1 043	1 066	1 002	960
Quarry and sand pits	562	609	679	757	772	787	901	940
SERVICES RELATED TO MINING	1 537	1 915	2 380	2 567	2 785	3 453	2 831	2 681
MINERAL MANUFACTURING								
Primary metals	5 293	5 617	5 646	5 809	6 019	6 272	6 339	6 458
Primary steel	2 035	2 292	2 347	2 388	2 414	2 498	2 425	2 529
Steel pipe and tube mills	333	422	457	425	504	582	575	579
Iron foundries	478	514	498	591	501	537	523	496
Nonferrous smelting and refining	1 775	1 633	1 600	1 641	1 722	1 728	1 790	1 739
Casting, rolling and extruding	672	756	744	764	878	927	1 026	1 116
Nonmetallic mineral products	2 547	2 589	2 656	2 704	2 871	3 117	3 405	3 684
Cement	319	339	375	370	393	421	435	451
Concrete products	408	358	384	433	419	477	515	582
Ready-mix concrete	407	453	461	423	460	476	519	548
Glass and glass products	582	609	626	634	677	766	928	1 033
Miscellaneous nonmetallic products	831	830	810	844	922	977	1 008	1 070
Petroleum and coal products	975	982	1 029	1 044	1 064	1 106	1 100	1 134

Sources: Natural Resources Canada; Statistics Canada.
n.a. Not applicable.
1 Industrial production includes mining, quarrying and oil wells, mineral manufacturing and other utility industries.

TABLE 10. CANADA, GROSS DOMESTIC PRODUCT BY INDUSTRY AT FACTOR COST AT 1992 PRICES, 1992-99

	1992	1993	1994	1995	1996	1997	1998	1999
	($ millions)							
Gross domestic product, all industries	604 275	618 422	645 956	663 082	673 086	700 804	721 003	750 040
Agriculture	10 260	11 127	11 391	11 682	12 281	12 296	12 809	13 562
Fishing and trapping	1 026	1 059	866	704	727	788	780	768
Logging and forestry	4 031	4 243	4 442	4 645	4 348	4 326	4 234	4 554
Mines (including milling), quarries and oil wells	23 054	23 942	25 067	25 932	26 398	27 593	27 502	28 721
Manufacturing	96 181	101 101	108 859	114 239	118 188	124 064	128 850	138 867
Construction	37 112	35 774	36 880	35 661	36 909	40 213	40 242	41 754
Transportation and storage	26 078	27 109	29 380	30 368	31 132	32 948	33 578	35 074
Communications	19 541	19 096	19 886	20 641	21 084	21 885	23 382	26 523
Electric power, gas and water utilities	22 368	22 967	23 629	24 534	24 912	25 001	24 445	25 322
Trade, wholesale	30 892	31 435	34 194	34 696	35 732	38 489	41 286	45 943
Trade, retail	35 262	36 537	38 793	40 282	40 890	43 188	44 778	46 545
Finance, insurance and real estate	97 577	100 556	105 182	106 183	110 754	114 842	117 976	120 083
Community, business and personal services	27 782	29 227	30 874	33 385	34 622	37 250	40 291	43 442
Government services	45 409	45 401	45 725	45 648	44 618	44 088	44 610	45 500

Source: Statistics Canada.

TABLE 11. CANADA, STAGE I TO STAGE IV, DOMESTIC EXPORTS OF MINERALS AND MINERAL PRODUCTS BY COMMODITY, 1997-99

	Unit of Measure	1997		1998		1999P	
	(000)	(Quantity)	($000)	(Quantity)	($000)	(Quantity)	($000)
METALS							
Aluminum	..	..	7 127 364	..	7 116 487	..	7 210 216
Antimony	kg	244	875	769	1 403	58	491
Bismuth	kg	135	1 415	175	2 015	188	2 102
Cadmium	kg	2 622	5 612	2 097	3 205	2 231	3 789
Calcium metal	kg	5 687	4 298	5 621	3 743	1 970	2 571
Chromium	kg	7 902	33 642	7 074	31 939	6 436	30 111
Cobalt	kg	6 356	431 471	7 049	472 106	6 539	295 153
Copper	..	..	2 929 108	..	2 432 249	..	1 992 081
Gold	..	..	3 485 710	..	3 384 921	..	2 811 480
Iron and steel	..	..	8 500 141	..	9 612 605	..	9 808 711
Iron ore	t	32 340	1 262 406	30 293	1 289 784	26 477	1 052 194
Lead	..	..	334 083	..	275 946	..	280 462
Magnesium and magnesium compounds	kg	106 592	252 921	111 569	273 404	118 011	251 523
Molybdenum	kg	11 303	91 702	10 778	67 770	10 663	47 307
Nickel	..	..	2 119 922	..	1 927 514	..	1 696 442
Platinum group	..	..	182 857	..	207 882	..	204 219
Silver	..	..	350 772	..	508 457	..	488 162
Tin	..	..	17 343	..	13 791	..	11 782
Titanium metals	kg	44 346	16 678	30 178	17 134	34 127	39 620
Uranium and thorium	..	..	970 889	..	786 159	..	700 600
Zinc	kg	1 121 286	1 789 170	1 088 406	1 552 139	1 029 140	1 587 723
Other metals	..	57 696	4 095 422	60 386	4 774 704	64 286	4 980 602
Total metals			34 003 801		34 755 357		33 497 341
NONMETALS							
Asbestos	..	..	308 350	..	264 272	..	271 021
Barite and witherite	t	21	5 907	25	9 158	16	6 061
Diamonds	t	..	13 660	110	6 869	..	14 002
Graphite	..	..	132 581	..	134 099	..	105 866
Gypsum	..	..	288 927	..	341 551	..	461 598
Mica	t	16	9 240	18	11 289	24	14 145
Nepheline syenite	t	372	50 498	338	52 205	331	48 976
Peat	..	..	288 094	..	320 963	..	329 792
Potash and potassium compounds	kg	14 647 353	1 752 693	14 278 282	1 978 593	14 355 031	2 109 326
Salt and sodium compounds	t	4 727	503 537	5 228	543 058	4 862	492 708
Silica and silica compounds	t	..	18 370	..	16 923	..	22 179
Sulphur and sulphur compounds	t	8 185	468 190	6 900	359 787	5 844	307 911
Talc, soapstone and pyrophyllite	t	26	8 010	30	10 227	44	17 687
Titanium oxides	kg	79 185	172 758	83 939	211 332	82 285	212 441
Other nonmetals	..	4 344 890	2 842 064	3 835 200	2 804 192	4 181 219	2 948 079
Total nonmetals		..	6 862 879	..	7 064 518	..	7 361 794
STRUCTURAL MATERIALS							
Cement	..	..	573 844	..	627 716	..	734 531
Clay and clay products	..	..	44 475	..	39 821	..	45 138
Lime	kg	224 233	27 203	171 447	21 300	96 081	13 214
Sand and gravel	t	1 809	15 680	1 999	19 723	2 874	25 713
Stone	..	4 122	117 019	4 181	138 546	3 121	154 158
Other structural materials	..	818 622	69 655	1 000 277	113 425	2 442 607	137 641
Total structural materials		..	847 876	..	960 531	..	1 110 395
FUELS							
Coal and coke	t	36 158	2 734 570	33 491	2 522 542	34 085	2 032 647
Natural gas	000 m³	81 795	8 625 631	89 163	8 967 101	94 380	11 021 970
Natural gas by-products	000 m³	8	1 161 236	9	863 115	8	979 309
Petroleum	..	..	17 003 934	..	12 949 875	..	15 030 687
Other fuels	kg	163 634	257 592	163 828	269 669	169 830	249 421
Total fuels		..	29 782 963	..	25 572 302	..	29 314 034
Total mineral domestic exports (including fuels)		..	71 497 519	..	68 352 708	..	71 283 564
Total economy domestic exports		..	281 255 740	..	297 451 300	..	330 409 547

Sources: Natural Resources Canada; Statistics Canada.
. . Not available or not applicable; P Preliminary.
Note: Numbers may not add to totals due to rounding.

TABLE 12. CANADA, STAGE I TO STAGE IV, IMPORTS OF MINERALS AND MINERAL PRODUCTS BY COMMODITY, 1997-99

	Unit of Measure	1997		1998		1999p	
	(000)	(Quantity)	($000)	(Quantity)	($000)	(Quantity)	($000)
METALS							
Aluminum	. .	. .	3 826 154	. .	4 372 743	. .	4 438 861
Antimony	kg	2 514	11 017	2 671	9 749	2 618	8 396
Bismuth	kg	237	3 043	220	2 426	182	1 564
Cadmium	kg	487	1 341	35	607	65	887
Calcium metal	kg	53 902	40 576	74 777	47 562	101 519	48 383
Chromium	kg	104 999	97 949	96 022	94 036	98 959	80 868
Cobalt	kg	1 213	63 955	1 522	62 975	1 187	37 432
Copper	. .	. .	1 810 273	. .	1 626 759	. .	1 659 267
Gold	. .	. .	1 438 458	. .	1 577 846	. .	1 059 555
Iron and steel	. .	. .	12 912 016	. .	15 463 893	. .	15 441 634
Iron ore	t	7 148	357 847	7 279	389 217	7 358	378 638
Lead	. .	. .	557 337	. .	596 860	. .	547 653
Magnesium and magnesium compounds	kg	326 106	203 457	277 286	186 692	199 939	211 265
Molybdenum	kg	3 677	40 489	4 216	41 009	5 027	39 316
Nickel	. .	. .	598 621	. .	640 843	. .	374 728
Platinum group	g	266 556	228 667	215 526	182 448	. .	181 516
Silver	. .	. .	142 555	. .	136 916	. .	133 485
Tin	. .	. .	59 242	. .	61 768	. .	74 012
Titanium metals	kg	11 460	73 751	8 327	94 962	7 832	68 247
Uranium and thorium	. .	. .	221 025	. .	223 768	. .	295 287
Zinc	. .	. .	275 863	. .	234 800	. .	262 609
Other metals	. .	86 950	8 291 411	97 698	9 957 426	90 290	10 829 715
Total metals			31 255 047		36 005 305		36 173 318
NONMETALS							
Asbestos	. .	. .	85 319	. .	81 052	. .	102 928
Barite and witherite	t	22	2 994	14	2 479	56	7 163
Diamonds	. .	. .	223 942	. .	251 158	. .	295 685
Graphite	. .	. .	368 882	. .	447 326	. .	505 651
Gypsum	. .	. .	30 702	. .	36 145	. .	46 356
Mica	t	4	12 369	5	11 465	5	13 265
Nepheline syenite	. .	. . .	12	. . .	3	. . .	13
Peat	. .	. .	1 289	. .	2 743	. .	1 815
Potash and potassium compounds	kg	. .	39 055	118 381	41 572	106 888	37 376
Salt and sodium compounds	t	2 306	318 161	1 928	308 362	2 450	326 733
Silica and silica compounds	. .	. .	125 731	. .	143 386	. .	195 782
Sulphur and sulphur compounds	kg	152	19 089	191	21 943	195	21 037
Talc, soapstone and pyrophyllite	kg	56	13 072	47	12 173	58	14 541
Titanium oxides	kg	110 846	230 258	116 794	269 981	111 959	276 401
Other nonmetals	. .	602 913	3 483 442	827 965	3 966 302	820 400	4 328 399
Total nonmetals			4 954 317		5 596 090		6 173 125
STRUCTURAL MATERIALS							
Cement	. .	. .	188 157	. .	210 285	. .	210 829
Clay and clay products	. .	. .	762 927	. .	883 009	. .	940 573
Lime	kg	47 382	6 380	33 988	5 752	54 515	7 724
Sand and gravel	t	3 207	17 621	3 068	18 956	3 034	17 993
Stone	. .	3 391	103 907	4 051	133 071	4 306	135 342
Other structural materials	. .	9 191	68 560	5 834	80 035	7 342	84 504
Total structural materials			1 147 552		1 331 108		1 396 965
FUELS							
Coal and coke	t	15 939	879 164	20 881	1 141 527	20 948	1 117 026
Natural gas	000 m³	953	137 292	734	104 003	630	87 885
Natural gas by-products	000 m³	. . .	56 091	. . .	56 798	. . .	71 269
Petroleum	. .	. .	11 428 657	. .	9 053 958	. .	9 765 972
Other fuels	. .	. .	347 620	. .	442 675	. .	495 193
Total fuels			12 848 824		10 798 961		11 537 345
Total mineral imports (including fuels)			50 205 740		53 731 464		55 280 753
Total economy imports			272 855 758		298 381 900		319 909 560

Sources: Natural Resources Canada; Statistics Canada.
. . Not available or not applicable; . . . Amount too small to be expressed; p Preliminary.
Note: Numbers may not add to totals due to rounding.

TABLE 13. CANADA, STAGE I TO STAGE IV, VALUE OF MINERALS AND MINERAL PRODUCTS, EXPORTS BY COMMODITY, BY DESTINATION, 1999P

	United States	EU	Japan	Mexico	Other	Total
			($000)			
METALS						
Aluminum	6 363 657	356 023	297 034	22 684	170 818	7 210 216
Antimony	491	–	–	–	–	491
Bismuth	1 236	461	405	–	–	2 102
Cadmium	1 957	1 333	412	–	87	3 789
Calcium metal	597	1 771	44	–	159	2 571
Chromium	29 769	30	–	–	312	30 111
Cobalt	41 131	67 857	56 722	10	129 433	295 153
Copper	1 631 100	99 385	148 835	47	112 714	1 992 081
Gold	2 691 453	2 918	39 688	4 625	72 796	2 811 480
Iron and steel	9 362 031	159 574	21 115	34 278	231 713	9 808 711
Iron ore	306 409	630 545	19 813	–	95 427	1 052 194
Lead	218 436	43 405	669	245	17 707	280 462
Magnesium and magnesium compounds	207 934	27 078	5 095	–	11 416	251 523
Molybdenum	12 729	17 481	15 456	–	1 642	47 307
Nickel	505 569	495 225	66 150	328	629 170	1 696 442
Platinum group	100 892	102 286	1 023	–	18	204 219
Silver	436 679	23 119	24 609	12	743	488 162
Tin	10 777	492	134	–	379	11 782
Titanium metals	38 065	1 111	67	..	377	39 620
Uranium and thorium	500 044	166 537	7 011	2 637	24 371	700 600
Zinc	1 064 458	342 897	19 951	52	160 365	1 587 723
Other metals	4 251 161	318 733	140 161	32 725	237 824	4 980 602
Total metals	27 779 575	2 858 261	864 393	97 643	1 897 471	33 497 341
NONMETALS						
Asbestos	76 084	11 585	39 687	10 898	132 767	271 021
Barite and witherite	5 485	–	–	–	576	6 061
Diamonds	13 870	132	–	–	–	14 002
Graphite	77 632	6 383	126	5 117	16 608	105 866
Gypsum	459 076	430	55	–	2 037	461 598
Mica	10 964	425	1 991	–	765	14 145
Nepheline syenite	42 453	1 541	717	182	4 083	48 976
Peat	296 536	10 651	14 286	17	8 302	329 792
Potash and potassium compounds	1 137 224	53 603	84 228	1 965	832 308	2 109 328
Salt and sodium compounds	447 590	1 474	7 268	426	35 950	492 708
Silica and silica compounds	17 999	57	–	24	4 099	22 179
Sulphur and sulphur compounds	70 766	–	574	22 121	214 450	307 911
Talc, soapstone and pyrophyllite	17 651	21	16	–	. . .	17 687
Titanium oxides	203 497	3 380	–	–	5 564	212 441
Other nonmetals	2 777 602	66 496	10 181	1 945	91 855	2 948 079
Total nonmetals	5 654 429	156 178	159 129	42 695	1 349 364	7 361 794
STRUCTURAL MATERIALS						
Cement	724 303	2 861	2 171	–	5 196	734 531
Clay and clay products	38 369	3 996	167	. . .	2 606	45 138
Lime	13 214	–	–	–	–	13 214
Sand and gravel	23 849	1	–	–	1 863	25 713
Stone	138 069	6 734	4 440	–	4 915	154 158
Other structural materials	127 740	1 163	788	2 380	5 570	137 641
Total structural materials	1 065 544	14 755	7 566	2 380	20 150	1 110 395
FUELS						
Coal and coke	180 060	308 002	895 450	17 795	631 340	2 032 647
Natural gas	11 021 954	–	–	–	16	11 021 970
Natural gas by-products	979 308	–	–	–	1	979 309
Petroleum	14 745 154	33 321	37 255	146	214 811	15 030 687
Other fuels	218 068	10 844	2 825	12	17 672	249 421
Total fuels	27 144 544	352 167	935 530	17 953	863 840	29 314 034
Total domestic mineral exports	61 644 092	3 381 361	1 966 618	160 671	4 130 825	71 283 564

Sources: Natural Resources Canada; Statistics Canada.
– Nil; . . . Amount too small to be expressed; P Preliminary.
Note: Numbers may not add to totals due to rounding.

TABLE 14. CANADA, STAGE I TO STAGE IV, VALUE OF MINERALS AND MINERAL PRODUCTS, IMPORTS BY COMMODITY, BY ORIGIN, 1999P

	United States	EU	Japan	Mexico	Other	Total
			($000)			
METALS						
Aluminum	3 322 624	267 809	10 728	4 055	833 645	4 438 861
Antimony	5 295	2 205	15	–	881	8 396
Bismuth	1 289	102	–	–	173	1 564
Cadmium	508	369	1	7	2	887
Calcium metal	36 640	7 005	53	–	4 676	48 383
Chromium	23 714	5 188	1 794	2 566	47 606	80 868
Cobalt	13 018	6 287	2 358	–	15 769	37 432
Copper	1 169 109	128 383	9 531	20 988	331 256	1 659 267
Gold	659 257	20 242	197	3 330	376 529	1 059 555
Iron and steel	11 344 281	1 429 743	695 346	324 174	1 648 090	15 441 634
Iron ore	346 333	779	1	1	31 524	378 638
Lead	439 506	26 662	12 654	16 474	52 357	547 653
Magnesium and magnesium compounds	125 850	11 860	731	370	72 454	211 265
Molybdenum	31 421	2 088	23	938	4 846	39 316
Nickel	171 405	56 749	62 178	13 793	70 603	374 728
Platinum group	88 429	34 711	5	6	58 365	181 516
Silver	55 895	11 080	898	27 062	38 550	133 485
Tin	47 917	2 724	13	319	23 039	74 012
Titanium metals	48 620	11 484	4 059	–	4 084	68 247
Uranium and thorium	41 338	9 599	179	. . .	244 171	295 287
Zinc	196 789	10 526	268	10 920	44 126	262 609
Other metals	7 104 689	905 602	208 019	1 047 733	1 563 673	10 829 715
Total metals	25 273 916	2 951 197	1 009 051	1 472 736	5 466 419	36 173 318
NONMETALS						
Asbestos	90 056	1 915	3 465	2 186	5 306	102 928
Barite and witherite	2 593	409	–	–	4 161	7 163
Diamonds	48 160	94 595	117	–	152 793	295 665
Graphite	370 908	52 581	36 234	2 103	43 825	505 651
Gypsum	37 753	2 876	66	2 923	2 738	46 356
Mica	9 385	2 927	243	–	710	13 265
Nepheline syenite	. . .	–	–	–	13	13
Peat	413	605	–	. . .	797	1 815
Potash and potassium compounds	31 296	2 725	36	25	3 294	37 376
Salt and sodium compounds	279 372	23 735	755	5 345	17 526	326 733
Silica and silica compounds	173 110	14 361	5 266	127	2 918	195 782
Sulphur and sulphur compounds	20 078	830	2	1	126	21 037
Talc, soapstone and pyrophyllite	14 196	55	181	–	109	14 541
Titanium oxides	189 542	71 082	1 529	1	14 247	276 401
Other nonmetals	3 391 837	380 752	91 589	97 234	356 989	4 328 399
Total nonmetals	4 658 699	659 448	139 483	109 945	605 552	6 173 125
STRUCTURAL MATERIALS						
Cement	178 002	9 143	1 753	4 798	17 133	210 829
Clay and clay products	386 327	287 053	26 760	45 513	214 920	940 573
Lime	7 672	7	–	–	45	7 724
Sand and gravel	17 784	74	3	5	127	17 993
Stone	95 780	42 659	6	1 943	34 954	135 342
Other structural materials	64 722	10 930	569	1 862	6 421	84 504
Total structural materials	690 287	349 866	29 091	54 121	273 600	1 396 965
FUELS						
Coal and coke	1 039 795	3 013	4 895	19	69 304	1 117 026
Natural gas	87 725	5	1	–	154	87 885
Natural gas by-products	70 443	109	22	–	695	71 269
Petroleum	2 301 456	1 993 080	4 907	267 138	5 199 391	9 765 972
Other fuels	438 525	47 385	4 115	2 060	3 108	495 193
Total fuels	3 937 944	2 043 592	13 940	269 217	5 272 652	11 537 345
Total mineral imports	34 560 846	6 004 103	1 191 565	1 906 019	11 618 223	55 280 753

Sources: Natural Resources Canada; Statistics Canada.
– Nil; . . . Amount too small to be expressed; P Preliminary.
Note: Numbers may not add to totals due to rounding.

TABLE 15. CANADA, APPARENT CONSUMPTION[1] OF SOME MINERALS AND RELATION TO PRODUCTION,[2] 1996-98

	1996			1997			1998		
	Apparent Consumption	Production	Consumption as a Percentage of Production	Apparent Consumption	Production	Consumption as a Percentage of Production	Apparent Consumption	Production	Consumption as a Percentage of Production
	(tonnes)		(%)	(tonnes)		(%)	(tonnes)		(%)
Quartz silica	1 925 544r	1 668 462	115.4	1 812 233r	1 792 778	101.1r	2 112 667	1 885 926	112.0
Lime[3]	2 221 823	2 402 032	92.5	2 299 721	2 476 571	92.9	2 323 585	2 461 043	94.4
Salt	9 569 294	12 248 477	78.1	11 125 685r	13 496 856	82.4	9 834 738	13 034 295	75.5
Cement[4]	6 864 706	11 587 385	59.2	7 155 518	11 736 272	61.0	6 952 314	12 124 058	57.3
Iron ore	13 353 341	34 399 968	38.8	13 695 396r	38 927 855	35.2	13 517 652	36 585 595	36.9
Gypsum	2 922 971	8 201 774	35.6	2 866 713	8 627 772	33.2	2 850 981	8 306 534	34.3
Potash (K_2O equivalent)	257 042	8 120 389	3.2	374 711	9 234 742	4.1	202 130	8 883 616	2.3
Asbestos	2 622	506 276	0.5	–	420 278	. .	1 900	321 330	0.6

Sources: Natural Resources Canada; Statistics Canada.
– Nil; . . Not available; K_2O potassium oxide; r Revised.
1 "Apparent consumption" is production plus imports, less exports. 2 "Production" refers to producers' shipments. 3 Apparent consumption contains slaked lime in the trade data. 4 Apparent consumption contains clinker cement in the trade data.

TABLE 16. CANADA, REPORTED CONSUMPTION OF MINERALS AND RELATION TO PRODUCTION, 1996-98

	Unit of Measure	1996			1997			1998		
		Consumption	Production	Consumption as a Percentage of Production	Consumption	Production	Consumption as a Percentage of Production	Consumption	Production	Consumption as a Percentage of Production
				(%)			(%)			(%)
METALS										
Aluminum[1]	t	686 969	2 283 212	30.1	781 268	2 327 188	33.6	902 514	2 374 118	38.0
Antimony	kg	688 800	1 380 169	49.9	1 158 210	529 198	218.9	791 255	359 347	220.2
Bismuth	kg	13 118r	149 839	8.8r	10 846r	195 720	5.5r	14 641	186 400	7.9
Cadmium	kg	99 323	1 540 072	6.4	123 192	1 272 172	9.7	117 122	1 179 427	9.9
Chromium (chromite)	t	17 466	–	. .	15 380	–	. .	16 964	–	. .
Cobalt	kg	147 350	2 150 339	6.9	136 382	2 167 554	6.3	145 983	2 262 477	6.5
Copper[2]	t	218 260	652 499	33.5	224 777	647 779	34.7	246 212	690 762	35.6
Lead[3]	t	93 373	241 751	38.6	92 997r	170 847	54.4	87 466	150 019	58.3
Magnesium	t	27 576	x	x	34 026	x	x	32 563	x	x
Manganese ore	t	9 747	–	. .	9 868	–	. .	7 339	–	. .
Mercury	kg	6 327	–	. .	x	–	x	2 803	–	x
Molybdenum (Mo content)	t	2 305	8 789	26.2	2 545	7 594	33.5	2 573	8 099	31.8
Nickel	t	24 504	182 404	13.4	19 447	180 624	10.8	19 243	197 947	9.7
Selenium	kg	15 815	693 666	2.3	9 175	592 135	1.5	9 782	397 878	2.5
Silver	kg	410 730	1 242 846	33.0	333 402	1 193 970	27.9	334 857	1 140 238	29.4
Tellurium	kg	x	58 700	x	x	59 322	x	x	62 274	x
Tin	t	2 796	–	. .	2 850	–	. .	2 753	–	. .
Tungsten (W content)	kg	397 770	–	. .	289 934	–	. .	212 415	–	. .
Zinc[3]	t	134 787r	1 162 720	11.6r	133 553r	1 026 864	13.0r	138 424	991 584	14.0
NONMETALS										
Barite	t	14 399	57 967	24.8	11 785	84 091	14.0	16 209	86 159	18.8
Feldspar	t	1 504	–	. .	1 578	–	. .	1 588	–	. .
Fluorspar	t	23 814	–	. .	75 791	–	. .	92 822	–	. .
Mica	t	3 211	x	x	3 334	x	x	3 606	x	x
Nepheline syenite	t	76 577	606 439	12.6	73 264	648 280	11.3	89 634	836 406	10.9
Phosphate rock	t	x	–	. .	x	–	. .	x	–	. .
Potash (K_2O equivalent)	t	216 349	8 120 389	2.7	217 841	9 234 742	2.4	271 078	8 883 616	3.1
Sodium sulphate	t	113 985	323 326	35.3	112 906	285 196	39.6	117 131	258 249	45.4
Sulphur	t	757 705	9 116 366	8.3	758 886	9 072 374	8.4	765 093	9 240 245	8.3
Talc, etc.	t	91 498	77 016	118.8	84 991	72 444	117.3	82 696	72 095	114.7
MINERAL FUELS										
Coal	000 t	53 511	75 880	70.5	55 734r	78 670	70.8	58 848	75 380	78.1
Crude oil[4]	000 m^3	92 587	117 621	78.8	96 431	123 827	77.9	95 435	128 401	74.3
Natural gas[5]	million m^3	54 674	153 578	35.6	52 541	156 171	33.6	45 608	160 515	28.4

Sources: Natural Resources Canada; Statistics Canada.
– Nil, . . Not available; r Revised; x Confidential.
1 Consumption of primary aluminum ingot and alloys, and secondary ingot and scrap, reported by consumers. 2 Consumption is defined as domestic shipments of refined copper plus imports of refined copper. 3 Consumption of primary and secondary refined metal. 4 Consumption is defined as refinery receipts. 5 Consumption is defined as domestic sales.
Notes: Unless otherwise stated, consumption refers to reported consumption of refined metals or nonmetallic minerals by consumers. Production of metals, in most cases, refers to production in all forms, and includes the recoverable content of ores, concentrates, matte, etc., and the metal content of primary products recoverable at domestic smelters and refineries. Production of nonmetals refers to producers' shipments. For fuels, production is equivalent to actual output less waste.

TABLE 17. CANADA, DOMESTIC CONSUMPTION OF PRINCIPAL REFINED METALS IN RELATION TO REFINERY PRODUCTION,[1] 1992-98

	Unit of Measure	1992	1993	1994	1995	1996	1997	1998
ALUMINUM								
Domestic consumption[2]	t	481 089	568 854	635 024	635 402	686 969	781 268	902 514
Production	t	1 971 843	2 308 867	2 254 683	2 171 992	2 283 212	2 327 188	2 374 118
Consumption as a percentage of production	%	24.4	24.6	28.2	29.3	30.1	33.6	38.0
COPPER								
Domestic consumption[3]	t	156 132	185 585	199 350	189 550	218 280	224 777	246 212
Production	t	539 302	561 580	549 869	572 618	559 200	560 582	562 261
Consumption as a percentage of production	%	29.0	33.0	36.3	33.1	39.0	40.1	43.8
LEAD								
Domestic consumption[4]	t	92 420	91 915	95 764	91 171	93 373	92 997r	87 466
Production[5]	t	252 885	217 014	251 640	281 391	310 791	271 395	265 487
Consumption as a percentage of production	%	36.5	42.4	38.1	32.4	30.0	34.3r	32.9
ZINC								
Domestic consumption[4]	t	114 725	110 570r	122 118r	130 735r	134 787r	133 553r	138 424
Production	t	671 702	659 881	690 965	720 346	716 467	703 798	745 131
Consumption as a percentage of production	%	17.1	16.8r	17.7r	18.1r	18.8r	19.0r	18.6

Source: Natural Resources Canada.
r Revised.
[1] Production of refined metal from all sources, including metal derived from secondary materials at primary refineries. [2] Consumption of primary aluminum ingot and alloys, and secondary ingot and scrap, reported by consumers. [3] Consumption is defined as domestic shipments of refined copper plus imports of refined copper. [4] Consumption of primary and secondary refined metal, reported by consumers. [5] Production of primary and secondary refined lead.

TABLE 18. AVERAGE ANNUAL PRICES[1] OF SELECTED METALS, 1992-99

	Unit	1992	1993	1994	1995	1996	1997	1998	1999
Aluminum, London Metal Exchange	¢/lb	56.893	51.639	66.986	81.903	68.296	72.544	61.574	61.738
Antimony, New York dealer	$/lb	0.791	0.769	1.777	2.278	1.486	0.998	0.718	0.827
Bismuth, New York dealer	$/lb	2.506	2.350	3.070	3.781	3.546	3.275	3.408	3.378
Cadmium, New York dealer	$/lb	0.907	0.451	1.144	1.839	1.238	0.513	0.286	0.177
Cobalt, metal, shot/cathode/250 kg	$/lb	24.300	18.000	19.900	27.089	27.500	27.500	27.500	27.500
Copper, electrolytic cathode, COMEX	¢/lb	102.721	85.283	107.052	134.717	105.872	103.580	75.077	72.111
Gold, London[2]	$/troy oz	343.731	359.769	384.009	384.162	387.696	331.096	294.180	278.825
Iridium, New York dealer	$/troy oz	155.167	45.667	30.000	30.000	46.188	171.125	392.032	379.938
Lead, London Metal Exchange cash	¢/lb	24.534	18.417	24.829	28.600r	35.019	28.292	23.960	22.778
Magnesium, U.S. primary ingot (Producer Price List)	¢/lb	1.439	1.530	1.538	1.805	1.930	1.800	1.800	1.800
Manganese, U.S. metal, regular	¢/lb	104.000	104.000	104.000	109.250	115.000	115.000	115.000r	115.000
Molybdenum, dealer, oxide	$/lb	2.197	2.279	4.501	7.412	3.606	4.175	3.313	2.591
Nickel, New York dealer, cathode	$/lb	3.177	2.428	2.919	3.901	3.501	3.221	2.179	2.750
Osmium, New York dealer	$/troy oz	400.000	400.000	400.000	399.375	392.458	391.000	366.867	350.000
Palladium, London PM fix	$/troy oz	88.228	122.348	142.631	151.229	128.079	177.951	284.678	357.902
Platinum, London PM fix	$/troy oz	359.799	374.027	404.998	424.348	397.171	395.210	372.019	376.880
Rhodium, New York dealer	$/troy oz	2 365.102	1 066.111	712.678	424.145	280.721	288.458	574.771	863.083
Ruthenium, New York dealer	$/troy oz	28.538	12.996	13.604	21.827	34.921	32.896	39.208	34.721
Selenium, New York dealer	$/lb	4.947	4.900	4.900	4.897	3.423	2.791	2.274	2.278
Silver, Handy & Harman, Toronto	$/troy oz	3.936	4.300	5.284	5.192	5.183	4.892	5.534	5.250
Tantalum, tantalite ore, spot	$/lb	27.365	25.850	25.500	26.260	27.000	27.000	32.783	33.000
Tin, New York dealer	$/lb	2.822	2.392	2.549	2.945	2.890	2.644	2.613	2.545
Tungsten, U.S. spot ore	$/stu	49.325	34.800	38.750	56.402	55.000	53.333	44.021r	40.000
Uranium, U_3O_8	$/lb	19.000	15.000	14.000	13.000	15.100r	14.200	13.300	12.700
Zinc, special high grade	¢/lb	56.235	43.635	45.255	53.235	51.109	59.897	46.453	48.805

Sources: Natural Resources Canada; *Metals Week*.
COMEX: Commodities Exchange, Inc.
r Revised; stu Short ton unit.
[1] Prices, except where noted, are in U.S. currency. [2] Average afternoon fixings of London bullion dealers.

TABLE 19. CANADIAN AVERAGE ANNUAL PRICES OF SELECTED METALS, 1992-99

	Unit	1992	1993	1994	1995	1996	1997	1998	1999
Aluminum, London Metal Exchange	$/kg	1.516	1.489	2.017	2.478	2.054	2.215	1.952	2.021
Antimony, New York dealer	$/kg	2.107	2.187	5.350	6.893	4.408	3.042	2.276	2.053
Bismuth, New York dealer	$/kg	6.676	6.684	9.243	11.441	10.883	10.000	10.805	11.059
Cadmium, New York dealer	$/kg	2.418	1.283	3.444	5.585	3.723	1.588	0.907	0.579
Cobalt, metal, shot/cathode/250 kg	$/kg	84.731	51.195	59.916	81.909	82.095	83.968	87.188	90.029
Copper, electrolytic cathode, COMEX	$/kg	2.738	2.426	3.223	4.078	3.184	3.183	2.380	2.381
Gold, London[1]	$/g	13.353	14.922	16.861	16.952	17.092	14.743	13.601	13.312
Iridium, New York dealer	$/g	0.928	1.894	1.317	1.324	2.026	7.620	18.128	18.139
Lead, London Metal Exchange, cash	¢/kg	54.088	40.862	54.739	63.052	77.204	62.373	52.823	50.217
Magnesium, U.S. primary ingot (Producer Price List)	$/kg	3.831	4.352	4.631	5.462	5.804	5.496	5.707	5.893
Manganese, U.S. metal, regular	$/kg	2.778	2.958	3.131	3.306	3.458	3.511	3.648[r]	3.765
Molybdenum, dealer, oxide	$/kg	5.852	6.482	13.552	22.428	10.844	12.748	10.504	8.482
Nickel, New York dealer, cathode	$/kg	8.483	8.906	8.789	11.804	10.528	9.835	9.908	9.003
Osmium, New York dealer	$/g	15.539	16.591	17.563	17.823	17.211	17.411	16.982	16.710
Palladium, London PM fix	$/g	3.427	5.075	6.283	6.873	5.617	7.924	13.162	17.087
Platinum, London PM fix	$/g	13.977	15.514	17.783	18.725	17.417	17.598	17.201	17.993
Rhodium, New York dealer	$/g	91.879	44.220	31.292	18.716	12.311	11.954	26.575	41.205
Ruthenium, New York dealer	$/g	1.109	0.539	0.597	0.963	1.931	1.485	1.813	1.658
Selenium, New York dealer	$/kg	13.178	13.938	14.753	14.815	10.293	6.522	7.210	7.458
Silver, Handy & Harman, Toronto	$/kg	152.905	178.354	232.011	229.107	227.293	217.835	255.870	250.653
Tantalum, tantalite ore, spot	$/kg	72.898	73.522	76.777	79.489	91.192	82.442	103.937	108.034
Tin, New York dealer	$/kg	7.517	6.803	7.675	8.911	8.690	8.075	8.284	8.333
Tungsten, U.S. spot ore	$/mtu	58.658	44.186	49.397	76.189	73.835	72.700	82.307[r]	58.460
Uranium	$/kg	59.000	50.000	51.000	47.000	53.600[r]	51.300	51.160	49.100
Zinc, special high grade	$/kg	1.498	1.241	1.383	1.611	1.537	1.823	1.473	1.598

Sources: Natural Resources Canada; *Metals Week*.
COMEX: Commodities Exchange, Inc.
mtu Metric tonne unit; [r] Revised.
[1] Average afternoon fixings of London bullion dealers.

TABLE 20. CANADA, PRINCIPAL STATISTICS OF THE MINERAL INDUSTRY,[1] 1997

		Mining Activity							Total Activity[2]		
		Production and Related Workers			Costs						
	Establishments	Employees	Person-Hours Paid	Wages	Fuel and Electricity	Materials and Supplies	Value of Production	Value Added	Employees	Salaries and Wages	Value Added
	(number)	(number)	(000)	($000)	($000)	($000)	($000)	($000)	(number)	($000)	($000)
METALS											
Gold	56	7 207	18 245	479 347	188 931	744 589	2 484 619	1 573 119	9 821	639 745	1 583 091
Silver-lead-zinc	7	2 113	4 656	113 999	49 085	648 491	1 190 873	493 098	3 058	180 851	493 283
Uranium	3	783	1 555	49 490	44 541	117 959	580 044	417 544	1 024	68 373	415 835
Iron	5	3 757	8 587	289 083	184 111	507 194	1 650 944	959 639	4 839	370 779	955 152
Nickel-copper-zinc	21	10 451	21 864	605 011	203 908	1 908 474	5 079 827	2 907 445	13 478	816 130	2 943 979
Miscellaneous metal mines[3]	5	810	1 694	41 443	19 208	58 238	209 992	133 547	992	51 349	132 470
Total	97	25 121	54 602	1 578 374	686 384	4 044 925	11 196 301	6 484 992	33 012	2 127 228	6 523 731
INDUSTRIAL MINERALS											
Asbestos	2	x	x	x	x	x	x	x	x	x	x
Peat	72	1 323	2 926	34 923	8 105	38 647	187 199	140 447	1 536	43 094	142 476
Gypsum	9	546	1 218	22 623	8 832	24 445	100 962	67 874	951	28 157	67 583
Potash	11	2 509	5 708	154 127	116 280	165 511	1 563 023	1 271 232	3 444	226 187	1 268 774
Stone	153	2 276	5 081	86 845	45 247	117 646	536 715	373 823	2 960	119 298	380 231
Sand and gravel	310	2 809	6 481	103 971	49 875	100 874	544 722	393 973	3 652	136 514	403 742
Salt	10	1 019	2 382	54 474	16 269	43 159	386 710	327 283	1 486	78 402	328 484
Miscellaneous nonmetals	20	x	x	x	x	x	x	x	x	x	x
Total	587	12 541	29 148	546 292	287 283	589 425	3 698 557	2 841 849	16 388	751 085	2 856 275
MINERAL FUELS											
Coal	32	7 389	15 623	426 500	159 940	904 457	2 002 191	1 337 794	8 930	518 038	1 376 440
Total mineral industry	716	45 031	98 372	2 551 155	1 113 607	5 118 807	16 897 049	10 664 634	58 310	3 396 351	10 736 448

Sources: Natural Resources Canada; Statistics Canada.
x Confidential.
1 Cement manufacturing, lime manufacturing, clay and clay products (domestic clays) are included in the mineral manufacturing industry. 2 Total activity includes sales and head offices.
3 Includes molybdenum.
Notes: This table no longer includes data for the petroleum and natural gas industries. Numbers may not add to totals due to rounding.

TABLE 21. CANADA, PRINCIPAL STATISTICS OF THE MINERAL INDUSTRY[1] BY REGION, 1997

Region	Establishments	Mines, Quarries and Oil Wells Activity: Production and Related Workers: Employees	Person-Hours Paid	Wages	Costs: Fuel and Electricity	Materials and Supplies	Value of Production	Value Added	Total Activity[2]: Employees	Salaries and Wages	Value Added
	(number)	(number)	(000)	($000)	($000)	($000)	($000)	($000)	(number)	($000)	($000)
Atlantic provinces[3]	84	6 295	13 666	337 821	142 282	723 874	2 044 327	1 178 171	7 838	419 182	1 172 022
Quebec	214	8 962	19 646	484 768	243 442	961 382	2 855 758	1 650 933	12 097	675 321	1 681 342
Ontario	204	11 516	25 505	647 525	228 332	1 388 070	4 695 459	3 079 057	15 050	875 993	3 084 276
Prairie provinces	141	9 986	21 413	552 648	263 294	841 054	3 954 498	2 850 150	12 707	739 164	2 873 998
British Columbia[4]	62	6 850	14 615	421 211	190 857	950 645	2 659 741	1 518 238	8 480	527 494	1 536 613
Yukon and Northwest Territories[5]	11	1 422	3 529	107 183	45 399	253 782	687 264	388 084	2 138	159 198	388 196
Total Canada	716	45 031	98 374	2 551 154	1 113 606	5 118 807	16 897 047	10 664 633	58 310	3 396 350	10 736 447

Sources: Natural Resources Canada; Statistics Canada.
[1] Cement manufacturing, lime manufacturing, clay and clay products (domestic clays) are included in the mineral manufacturing industry. [2] Total activity includes sales and head offices.
[3] Includes eastern Canada offshore. [4] Includes western Canada offshore. [5] Includes Arctic Islands.
Notes: This table no longer includes data for the petroleum and natural gas industries. Numbers may not add to totals due to rounding.

TABLE 22. CANADA, PRINCIPAL STATISTICS OF THE MINERAL MANUFACTURING INDUSTRIES, 1997

	Establishments	Mineral Manufacturing Activity: Production and Related Workers: Employees	Person-Hours Paid	Wages	Costs: Fuel and Electricity	Materials and Supplies	Value of Shipments	Value Added	Total Activity[1]: Employees	Salaries and Wages	Value Added
	(number)	(number)	(000)	($ millions)	($ millions)	($ millions)	($ millions)	($ millions)	(number)	($ millions)	($ millions)
PRIMARY METAL INDUSTRIES											
Smelting and refining	41	20 385	39 001	1 041.9	947.6	3 178.2	7 990.9	3 892.4	26 669	1 415.3	3 809.7
Primary steel	57	25 113	58 678	1 373.1	679.2	6 175.6	11 097.1	4 307.9	32 080	1 817.4	4 270.0
Steel pipe and tube	67	5 403	11 328	236.2	28.6	1 720.1	2 687.4	1 025.4	6 589	313.5	1 046.1
Iron foundries	74	6 353	12 696	255.0	62.7	401.5	1 125.8	681.6	7 375	313.9	691.3
Aluminum rolling, casting and extruding	78	4 966	10 605	223.9	45.8	2 121.7	2 724.9	574.7	6 240	303.4	547.9
Metal rolling, casting and extruding n.e.s.	99	6 732	14 558	262.3	40.8	854.1	1 540.6	646.4	7 819	324.5	645.5
Copper and alloy rolling, casting and extruding	37	2 219	4 312	83.7	16.1	545.7	752.3	185.3	2 533	99.5	185.6
Total	453	71 171	151 177	3 476.1	1 820.8	14 997.1	27 918.9	11 313.7	89 305	4 587.5	11 196.0
NONMETALLIC MINERAL PRODUCTS INDUSTRIES											
Ready-mix concrete	688	8 940	18 583	317.5	67.5	1 075.1	1 879.6	737.4	10 963	404.6	767.4
Cement	20	1 802	3 935	99.9	178.5	198.0	1 173.0	789.1	2 664	159.5	792.4
Glass products	166	5 536	11 599	192.6	28.8	531.3	1 035.9	477.0	6 575	242.2	493.4
Primary glass and glass containers	24	2 703	5 836	122.7	50.8	174.4	626.0	391.1	3 260	158.1	389.7
Mineral insulating products	33	1 464	3 035	61.8	30.6	154.9	415.7	230.0	1 910	86.2	302.6
Other concrete products	282	3 466	7 073	103.5	16.6	214.0	540.8	308.3	4 348	142.2	320.2
Structural concrete products	64	2 172	4 432	71.9	8.4	122.7	335.6	203.7	2 720	97.5	203.1
Other nonmetallic mineral products	183	1 920	3 948	62.4	10.9	133.7	326.6	182.7	2 532	86.7	195.9
Refractory products	30	1 819	3 736	74.0	9.4	145.3	305.5	145.4	2 428	99.6	163.8
Gypsum products	35	1 835	4 052	79.7	40.4	305.0	674.8	326.8	2 414	112.2	326.7
Concrete pipe	39	1 106	2 300	39.0	5.6	82.2	233.7	144.7	1 482	55.7	148.4
Lime	13	632	1 391	31.5	51.9	42.1	240.6	147.5	812	40.5	148.1
Abrasives	29	1 089	2 308	41.7	31.6	125.2	305.4	145.1	1 299	52.9	167.7
Clay products (domestic)	16	650	1 356	21.9	15.4	24.2	135.7	91.0	870	39.4	91.3
Clay products (imported)	43	866	1 926	27.0	5.1	24.8	122.7	93.7	1 041	35.8	90.7
Asbestos products industry	6	208	412	4.3	0.6	14.4	34.9	20.1	317	8.3	23.8
Total	1 631	36 208	75 924	1 351.5	552.0	3 367.1	8 386.3	4 433.6	45 635	1 821.4	4 625.4
FABRICATED METAL PRODUCTS INDUSTRIES											
Wire and wire products	279	10 835	22 363	360.8	47.7	1 169.6	2 206.5	999.6	13 322	483.7	1 005.6
Stamped and pressed metal products industries	961	30 692	63 599	946.4	112.1	3 452.5	5 995.2	2 448.1	35 622	1 199.1	2 465.2
Fabricated structural metal products industries	536	17 492	36 370	600.2	38.7	1 690.7	3 186.1	1 452.2	21 381	798.2	1 487.5
Hardware, tool and cutlery industry	874	23 461	51 136	860.5	54.5	1 017.6	3 027.0	1 941.6	27 082	1 093.2	1 980.5
Other metal fabricating industries	582	16 080	33 825	525.2	51.7	1 462.9	2 903.9	1 408.0	20 195	741.1	1 548.3
Machine shop industry	1 700	26 184	53 791	818.5	45.6	995.3	2 933.6	1 904.6	30 500	1 038.1	1 913.1
Ornamental and architectural metal products industries	698	12 320	25 300	345.5	23.3	1 230.9	2 213.2	966.6	16 172	522.0	994.9
Power boiler and heat exchanger industry	43	2 475	5 221	88.1	5.8	286.2	637.1	337.0	3 735	159.4	334.7
Heating equipment industry	114	4 093	8 468	108.9	6.8	328.7	680.8	357.7	5 413	168.8	404.6
Total	5 787	143 632	300 073	4 654.1	386.3	11 634.4	23 783.2	11 815.4	173 422	6 203.5	12 134.4
PETROLEUM AND COAL PRODUCTS INDUSTRIES											
Petroleum refining products	32	4 035	9 277	280.0	323.7	17 683.6	19 863.6	1 883.1	10 050	714.5	1 895.9
Lubricating oils and greases	30	730	1 543	31.8	8.2	437.0	667.6	218.8	1 272	62.6	237.7
Other petroleum and coal products	124	1 101	2 169	36.8	19.1	321.2	505.0	165.2	1 468	58.2	175.2
Total	186	5 866	12 989	348.6	351.0	18 441.8	21 036.1	2 267.1	12 790	835.3	2 308.7
Total mineral manufacturing industries	8 057	256 877	540 163	9 830.2	3 110.1	48 440.4	31 124.6	29 829.8	321 152	13 447.7	30 264.5

Source: Statistics Canada, catalogue no. 31-203.
n.e.s. Not elsewhere specified.
[1] Total activity includes sales and head offices.

TABLE 23. CANADA, PRINCIPAL STATISTICS OF THE MINERAL MANUFACTURING INDUSTRIES, 1996

	Mineral Manufacturing Activity								Total Activity[1]		
		Production and Related Workers			Costs						
	Establishments	Employees	Person-Hours Paid	Wages	Fuel and Electricity	Materials and Supplies	Value of Shipments	Value Added	Employees	Salaries and Wages	Value Added
	(number)	(number)	(000)	($ millions)	($ millions)	($ millions)	($ millions)	($ millions)	(number)	($ millions)	($ millions)
PRIMARY METAL INDUSTRIES											
Smelting and refining	41	20 671	41 127	1 024.9	911.0	3 088.4	7 387.9	3 400.7	26 529	1 355.8	3 389.8
Primary steel	59	25 321	59 756	1 340.8	627.7	5 930.4	10 658.8	3 986.5	32 190	1 767.0	3 949.6
Steel pipe and tube	64	4 816	10 038	213.1	27.4	1 438.8	2 246.9	775.9	6 014	285.4	780.3
Iron foundries	78	6 090	12 448	243.1	62.6	364.2	1 050.7	612.6	7 002	297.4	627.9
Aluminum rolling, casting and extruding	75	4 781	10 557	217.4	42.6	1 749.8	2 378.9	581.0	6 038	292.7	581.2
Metal rolling, casting and extruding n.e.s.	101	5 485	12 355	214.2	34.6	757.6	1 404.9	616.6	6 370	263.2	618.3
Copper and alloy rolling, casting and extruding	34	1 818	3 655	69.1	15.1	636.4	823.5	172.8	2 100	84.3	173.1
Total	452	68 962	149 938	3 322.7	1 721.0	13 965.7	25 949.7	10 146.2	86 241	4 345.8	10 120.3
NONMETALLIC MINERAL PRODUCTS INDUSTRIES											
Ready-mix concrete	700	8 342	17 627	284.4	63.9	971.4	1 776.5	740.5	10 488	381.6	756.4
Cement	18	1 779	4 000	94.6	166.9	196.4	1 083.5	704.1	2 659	149.7	697.9
Glass products	169	4 455	9 181	146.5	20.7	391.5	888.6	474.4	5 363	187.6	480.2
Primary glass and glass containers	27	3 602	8 235	146.0	63.8	200.6	718.0	451.2	4 473	189.0	463.3
Mineral insulating products	32	1 445	3 013	58.5	31.4	144.8	439.9	261.9	1 943	85.6	332.9
Other concrete products	264	2 989	6 230	88.0	13.5	172.5	458.1	270.0	3 868	125.7	276.6
Structural concrete products	70	1 856	3 866	61.1	7.3	110.1	300.8	184.2	2 406	85.2	182.5
Other nonmetallic mineral products	169	1 902	4 092	61.7	9.6	119.0	313.7	187.6	2 580	89.2	241.9
Refractory products	31	1 602	3 263	61.0	8.7	132.4	280.7	139.9	2 178	87.2	153.1
Gypsum products	32	1 512	3 179	62.6	32.7	243.8	559.4	283.3	2 058	92.8	287.2
Concrete pipe	39	1 013	2 052	33.2	5.3	71.3	202.5	129.1	1 278	45.5	131.4
Lime	13	606	1 388	28.8	44.6	33.9	207.7	129.1	741	35.8	128.4
Abrasives	31	1 025	2 148	35.3	32.0	109.7	298.2	165.5	1 247	46.8	171.0
Clay products (domestic)	16	585	956	14.8	13.1	18.4	101.9	68.6	888	30.8	68.3
Clay products (imported)	44	699	1 481	21.7	4.5	20.3	103.3	79.6	826	27.1	75.8
Asbestos products industry	6	192	375	3.9	0.6	12.6	31.5	18.9	300	8.8	23.1
Total	1 661	33 604	71 086	1 202.1	518.6	2 946.5	7 764.1	4 287.9	43 296	1 668.3	4 469.9
FABRICATED METAL PRODUCTS INDUSTRIES											
Wire and wire products	293	9 939	20 662	329.1	45.2	1 088.9	2 137.9	991.7	12 548	452.0	1 027.6
Stamped and pressed metal products industries	988	25 657	54 721	810.1	103.7	2 970.5	5 442.7	2 349.3	30 615	1 053.1	2 371.8
Fabricated structural metal products industries	522	14 783	31 223	514.9	32.9	1 428.1	2 897.2	1 415.0	18 481	687.2	1 437.2
Hardware, tool and cutlery industry	910	19 508	42 677	709.9	34.9	917.5	2 805.4	1 895.5	23 088	912.4	1 936.5
Other metal fabricating industries	592	12 666	26 506	401.8	43.0	1 263.9	2 521.7	1 235.5	16 386	583.8	1 301.1
Machine shop industry	1 787	21 773	46 180	693.8	38.6	854.9	2 691.4	1 813.5	26 180	896.1	1 822.1
Ornamental and architectural metal products industries	752	11 526	23 657	317.3	21.7	1 048.2	2 108.7	1 036.2	15 037	463.6	1 053.3
Power boiler and heat exchanger industry	42	1 932	4 325	71.7	5.3	257.8	765.4	438.2	3 278	164.6	436.5
Heating equipment industry	123	3 695	7 763	97.2	6.7	299.3	677.5	361.4	4 836	145.0	370.6
Total	6 009	121 479	257 713	3 945.8	331.9	10 129.1	22 045.9	11 536.3	150 429	5 358.0	11 756.6
PETROLEUM AND COAL PRODUCTS INDUSTRIES											
Petroleum refining products	32	4 192	9 015	254.0	300.6	18 056.6	19 854.1	1 575.5	9 303	579.8	1 573.8
Lubricating oils and greases	33	968	2 109	40.8	9.6	392.6	690.0	290.8	1 567	70.8	306.4
Other petroleum and coal products	113	1 103	2 215	35.1	17.7	242.8	432.8	174.0	1 521	55.0	197.0
Total	178	6 263	13 338	329.9	327.9	18 692.0	20 976.9	2 040.0	12 391	705.6	2 077.2
Total mineral manufacturing industries	8 300	230 308	492 074	8 800.5	2 899.4	45 735.3	76 736.6	28 010.4	292 357	12 077.7	23 424.0

Source: Statistics Canada, catalogue no. 31-203.
n.e.s. Not elsewhere specified.
[1] Total activity includes sales and head offices.

TABLE 24. CANADA, PRINCIPAL STATISTICS OF THE MINERAL MANUFACTURING INDUSTRIES BY REGION, 1997

	Mineral Manufacturing Activity								Total Activity[1]		
		Production and Related Workers			Costs						
	Establishments	Employees	Person-Hours Paid	Wages	Fuel and Electricity	Materials and Supplies	Value of Shipments	Value Added	Employees	Salaries and Wages	Value Added
	(number)	(number)	(000)	($000)	($000)	($000)	($000)	($000)	(number)	($000)	($000)
PRIMARY METAL INDUSTRIES[2]											
Atlantic provinces	11	x	x	x	x	x	x	x	x	x	x
Quebec	121	20 843	41 192	982.9	941.9	4 881.6	9 562.2	3 771.3	26 634	1312.9	3 728.0
Ontario	224	39 689	89 386	1 989.0	705.6	8 075.0	14 465.0	5 814.3	49 311	2 603.7	5 759.1
Prairie provinces	51	x	x	x	x	x	x	x	x	x	x
British Columbia	46	4 271	7 797	209.9	21.7	376.2	1 070.8	651.7	5 609	285.5	631.2
Yukon and Northwest Territories	–	–	–	–	–	–	–	–	–	–	–
Total Canada	453	71 171	151 177	3 476.1	1 820.8	14 997.1	27 918.9	11 313.8	89 305	4 587.5	11 195.9
NONMETALLIC MINERAL PRODUCTS INDUSTRIES											
Atlantic provinces	121	1 906	3 861	53.1	26.9	137.3	330.5	165.8	2 442	74.8	166.2
Quebec	407	8 692	17 642	280.6	117.6	678.2	1 789.2	988.1	11 531	408.6	1 012.7
Ontario	579	16 331	35 060	679.3	282.8	1 626.6	4 003.9	2 069.7	20 242	890.8	2 194.8
Prairie provinces	299	5 079	10 683	181.4	71.3	490.5	1 270.1	705.8	6 283	240.7	733.5
British Columbia	225	4 200	8 678	157.0	53.5	434.4	992.6	504.2	5 137	206.5	518.1
Yukon and Northwest Territories	–	–	–	–	–	–	–	–	–	–	–
Total Canada	1 631	36 208	75 924	1 351.5	552.0	3 367.1	8 386.3	4 433.6	45 635	1 821.4	4 625.4
FABRICATED METAL PRODUCTS INDUSTRIES[2]											
Atlantic provinces	171	3 321	6 835	100.1	6.8	231.0	473.8	239.5	4 182	132.9	247.1
Quebec	1 372	27 348	55 326	811.6	80.3	2 440.5	4 882.2	2 368.3	36 322	1 187.5	2 416.3
Ontario	2 842	83 534	176 990	2 786.4	235.7	6 565.1	13 832.5	6 850.7	97 375	3 611.8	7 025.2
Prairie provinces	768	19 520	39 955	590.5	40.6	1 426.7	2 980.2	1 528.9	23 370	793.8	1 581.4
British Columbia	634	9 909	20 968	365.5	22.8	971.1	1 814.6	826.1	12 173	477.5	864.4
Yukon and Northwest Territories	–	–	–	–	–	–	–	–	–	–	–
Total Canada	5 787	143 632	300 073	4 654.1	386.3	11 634.4	23 783.2	11 815.4	173 422	6 203.5	12 134.4
PETROLEUM AND COAL PRODUCTS INDUSTRIES											
Atlantic provinces	11	x	x	x	x	x	x	x	x	x	x
Quebec	52	1 153	2 681	75.6	66.9	3 367.9	3 976.4	532.3	2 315	146.3	534.4
Ontario	72	2 198	4 828	122.8	125.6	6 070.5	6 763.7	560.5	5 133	336.5	589.3
Prairie provinces	39	x	x	x	x	x	x	x	x	x	x
British Columbia	12	350	729	18.8	11.8	1 148.8	1 373.5	207.3	579	35.9	202.6
Yukon and Northwest Territories	–	–	–	–	–	–	–	–	–	–	–
Total Canada	186	5 886	12 989	348.6	351.0	18 441.8	21 036.1	2 267.1	12 790	835.3	2 308.7
TOTAL MINERAL MANUFACTURING INDUSTRIES											
Atlantic provinces	314	x	x	x	x	x	x	x	x	x	x
Quebec	1 952	58 036	116 841	2 150.7	1 206.7	11 368.2	20 210.0	7 660.0	76 802	3 055.4	7 691.4
Ontario	3 717	141 752	306 264	5 577.5	1 349.8	22 337.2	38 865.2	15 295.2	172 061	7 442.8	15 548.4
Prairie provinces	1 157	x	x	x	x	x	x	x	x	x	x
British Columbia	917	18 730	38 173	751.2	109.7	2 930.8	5 251.5	2 191.3	23 498	1 005.3	2 216.4
Yukon and Northwest Territories	–	–	–	–	–	–	–	–	–	–	–
Total Canada	8 057	256 877	540 163	9 830.2	3 110.1	48 440.4	81 124.6	29 829.8	321 152	13 447.7	30 264.5

Source: Statistics Canada, catalogue no.31-203.
– Nil; x Confidential.
[1] Total activity includes sales and head offices. [2] Wire and wire products have been included in the primary metal industries group.

TABLE 25. CANADA, PRINCIPAL STATISTICS OF THE MINERAL MANUFACTURING INDUSTRIES BY REGION, 1996

	Mineral Manufacturing Activity								Total Activity[1]		
		Production and Related Workers			Costs						
	Establishments	Employees	Person-Hours Paid	Wages	Fuel and Electricity	Materials and Supplies	Value of Shipments	Value Added	Employees	Salaries and Wages	Value Added
	(number)	(number)	(000)	($000)	($000)	($000)	($000)	($000)	(number)	($000)	($000)
PRIMARY METAL INDUSTRIES[2]											
Atlantic provinces	12	x	x	x	x	x	x	x	x	x	x
Quebec	118	20 427	42 132	965.3	890.7	4 444.7	8 649.9	3 350.1	25 900	1 255.9	3 329.0
Ontario	222	38 511	87 605	1 908.9	653.8	7 616.1	13 733.9	5 307.4	47 693	2 496.2	5 306.5
Prairie provinces	53	4 702	10 173	210.7	118.9	1 187.9	2 088.7	799.8	5 727	280.3	804.9
British Columbia	47	x	x	x	x	x	x	x	x	x	x
Yukon and Northwest Territories	–	–	–	–	–	–	–	–	–	–	–
Total Canada	452	68 962	149 936	3 322.7	1 721.0	13 965.7	25 949.7	10 146.2	86 241	4 345.8	10 120.3
NONMETALLIC MINERAL PRODUCTS INDUSTRIES											
Atlantic provinces	126	1 933	3991	55.8	28.1	152.6	344.0	164.6	2 528	78.5	166.0
Quebec	418	8 453	17 828	269.3	120.1	648.5	1 702.6	935.5	11 253	400.4	955.4
Ontario	581	15 050	32 068	586.6	261.1	1 341.6	3 653.0	2 041.8	19 204	793.6	2 133.3
Prairie provinces	304	4 442	9 440	152.3	62.6	416.1	1 150.3	671.4	5 678	212.9	733.6
British Columbia	232	3 726	7 760	138.0	48.7	389.8	914.3	474.5	4 635	182.9	479.7
Yukon and Northwest Territories	–	–	–	–	–	–	–	–	–	–	–
Total Canada	1 661	33 604	71 086	1 202.1	518.6	2 948.5	7 764.1	4 287.9	43 296	1 663.3	4 468.9
FABRICATED METAL PRODUCTS INDUSTRIES[2]											
Atlantic provinces	191	2 994	6 088	88.3	6.0	212.1	424.7	208.7	3 796	115.4	218.1
Quebec	1 453	26 711	54 871	788.2	77.3	2 346.0	4 762.8	2 335.8	35 604	1 132.5	2 388.2
Ontario	2 931	68 765	148 680	2 313.2	195.2	5 570.5	12 651.7	6 832.8	82 009	3 069.8	6 905.7
Prairie provinces	784	14 252	29 815	436.0	32.5	1 140.7	2 479.2	1 303.2	17 986	611.1	1 342.6
British Columbia	650	8 757	18 259	322.0	20.9	859.9	1 727.5	855.9	11 034	429.4	904.0
Yukon and Northwest Territories	–	–	–	–	–	–	–	–	–	–	–
Total Canada	6 009	121 479	257 713	3 945.8	331.9	10 129.1	22 045.9	11 536.3	150 429	5 358.0	11 758.8
PETROLEUM AND COAL PRODUCTS INDUSTRIES											
Atlantic provinces	11	x	x	x	x	x	x	x	x	x	x
Quebec	39	1 234	2 559	65.7	73.1	3 553.2	4 090.9	481.1	2 314	126.8	491.2
Ontario	75	2 609	5 527	135.6	115.0	6 060.3	6 681.7	517.1	5 609	333.8	528.8
Prairie provinces	40	1 432	3 053	78.3	96.3	4 827.3	5 474.0	577.0	2 713	146.2	563.9
British Columbia	12	x	x	x	x	x	x	x	x	x	x
Yukon and Northwest Territories	1	x	x	x	x	x	x	x	x	x	x
Total Canada	178	6 263	13 338	329.9	327.9	18 692.0	20 976.9	2 040.0	12 391	705.6	2 077.2
TOTAL MINERAL MANUFACTURING INDUSTRIES											
Atlantic provinces	340	x	x	x	x	x	x	x	x	x	x
Quebec	2 028	56 825	117 391	2 088.5	1 161.1	10 992.3	19 206.1	7 182.5	74 971	2 915.7	7 183.9
Ontario	3 809	124 935	273 880	4 944.3	1 225.1	20 588.5	36 766.3	14 699.9	154 715	6 593.2	14 874.4
Prairie provinces	1 181	x	x	x	x	x	x	x	x	x	x
British Columbia	941	x	x	x	x	x	x	x	x	x	x
Yukon and Northwest Territories	–	–	–	–	–	–	–	–	–	–	–
Total Canada	8 300	230 308	492 074	8 800.5	2 899.4	45 735.3	78 736.8	28 010.4	292 357	12 077.7	28 424.8

Source: Statistics Canada, catalogue no.31-203.
– Nil; x Confidential.
[1] Total activity includes sales and head offices. [2] Wire and wire products have been included in the primary metal industries group.

TABLE 26. CANADA, PRINCIPAL STATISTICS OF THE MINERAL INDUSTRY,[1] 1983-97

Year	Establishments	Mining Activity: Production and Related Workers: Employees	Person-Hours Paid	Wages	Costs: Fuel and Electricity	Materials and Supplies	Value of Production	Value Added	Total Activity[2]: Employees	Salaries and Wages	Value Added
	(number)	(number)	(000)	($000)	($000)	($000)	($000)	($000)	(number)	($000)	($000)
1983	481	58 469	114 700	1 684 907	826 427	3 158 440	9 841 152	5 856 285	80 413	2 446 855	5 840 910
1984	472	61 150	123 628	1 987 010	971 932	3 569 181	12 053 167	7 512 054	81 846	2 767 611	7 537 288
1985	472	58 347	121 709	2 009 484	1 005 557	3 605 813	11 664 215	7 052 845	77 663	2 771 242	7 066 445
1986	505	55 542	117 173	2 004 975	951 854	3 655 623	11 734 946	7 127 469	74 497	2 784 083	7 172 484
1987	538	55 776	120 946	2 079 717	938 764	3 896 427	13 729 648	8 894 456	73 821	2 850 388	8 960 120
1988	539	58 251	126 216	2 348 492	970 964	4 463 879	17 060 361	11 625 518	76 995	3 197 809	11 694 930
1989	537	59 593	129 946	2 562 805	1 013 010	4 712 423	17 445 454	11 720 021	78 279	3 460 651	11 826 348
1990	521	55 558	121 448	2 510 817	1 061 769	4 619 245	16 158 688	10 477 673	73 156	3 391 151	10 571 448
1991	498	51 642	112 344	2 446 055	1 043 554	4 318 454	14 359 030	8 997 022	68 747	3 383 119	9 094 572
1992	469	46 819	101 065	2 278 504	960 413	4 249 868	13 705 148	8 494 868	62 257	3 136 794	8 566 223
1993	459	44 053	94 733	2 139 903	933 552	3 931 954	12 598 992	7 733 486	58 325	2 928 793	7 793 020
1994[r]	555	44 083	95 756	2 227 755	970 304	3 938 223	13 872 653	8 964 126	58 195	3 019 806	9 059 983
1995[r]	730	46 728	101 852	2 421 274	1 065 118	4 652 556	16 771 037	11 053 363	61 193	3 262 475	11 133 393
1996[r]	727	45 552	99 534	2 466 512	1 126 756	4 939 053	16 560 844	10 495 035	59 555	3 306 371	10 570 423
1997	716	45 031	98 372	2 551 155	1 113 607	5 118 807	16 897 049	10 664 634	58 310	3 396 351	10 738 446

Source: Natural Resources Canada.
[r] Revised.
[1] Cement manufacturing, lime manufacturing, clay and clay products (domestic clay) are included in the mineral manufacturing industry. [2] Total activity includes sales and head offices.
Note: This table no longer includes data for the petroleum and natural gas industries.

TABLE 27. CANADA, PRINCIPAL STATISTICS OF THE MINERAL MANUFACTURING INDUSTRIES,[1] 1984-97

	Establishments	Mineral Manufacturing Activity: Production and Related Workers: Employees	Person-Hours Paid	Wages	Costs: Fuel and Electricity	Materials and Supplies	Value of Shipments	Value Added	Total Activity[2]: Employees	Salaries and Wages	Value Added
	(number)	(number)	(000)	($000)	($000)	($000)	($000)	($000)	(number)	($000)	($000)
1984	472	61 150	123 628	1 987 009	971 932	3 569 182	12 053 168	7 512 055	81 846	2 767 611	7 537 288
1985	472	58 347	121 710	2 009 484	1 005 556	3 605 812	11 664 217	7 052 845	77 663	2 771 242	7 066 446
1986	505	55 542	117 172	2 004 975	951 855	3 655 624	11 734 947	7 127 468	74 497	2 784 084	7 172 484
1987	538	55 776	120 946	2 079 716	938 764	3 896 427	13 729 648	8 894 456	73 821	2 850 389	8 960 120
1988	539	58 251	126 215	2 348 493	970 964	4 463 880	17 060 362	11 625 517	76 995	3 197 809	11 694 931
1989	537	59 593	129 946	2 562 804	1 013 010	4 712 422	17 445 454	11 720 020	78 279	3 460 650	11 826 346
1990	521	55 558	121 446	2 510 817	1 061 768	4 619 245	16 158 687	10 477 673	73 156	3 391 151	10 571 447
1991	498	51 642	112 344	2 446 055	1 043 554	4 318 454	14 359 030	8 997 022	68 747	3 383 119	9 094 573
1992	469	46 819	101 065	2 278 504	960 413	4 249 869	13 705 149	8 494 869	62 257	3 136 793	8 566 224
1993	459	44 053	94 732	2 139 904	933 551	3 931 953	12 598 992	7 733 487	58 325	2 928 792	7 793 019
1994	555	44 208	96 299	2 228 567	970 305	3 938 222	13 872 653	8 964 125	58 320	3 020 619	9 059 983
1995	730	46 718	101 989	2 420 778	1 059 772	4 741 869	16 770 594	10 968 953	61 140	3 259 174	11 048 503
1996	481	58 469	114 701	1 684 906	826 427	3 158 440	9 841 153	5 856 285	80 413	2 446 855	5 840 910
1997	472	61 150	123 628	1 987 009	971 932	3 569 182	12 053 168	7 512 055	81 846	2 767 611	7 537 288

Source: Statistics Canada.
[1] Includes the following industries: primary metals, nonmetallic mineral products, fabricated metal products, and petroleum and coal products. [2] Total activity includes sales and head offices.

TABLE 28. CANADA, CONSUMPTION OF FUEL AND ELECTRICITY IN THE MINERAL INDUSTRY,[1] 1997

	Unit	Metals	Nonmetals	Structural Materials	Total
Coal	000 t	...	–	–	...
	$000	11	–	–	11
Gasoline	000 litres	18 189	3 799	15 592	37 580
	$000	8 597	1 878	7 628	18 103
Fuel oil, kerosene, diesel oil	000 litres	742 533	131 909	133 672	1 008 114
	$000	190 471	34 918	54 026	279 413
Liquefied petroleum gas	000 litres	138 018	10 886	3 962	150 864
	$000	30 167	2 650	808	33 625
Natural gas	000 m^3	112 636	782 624	23 316	918 576
	$000	13 997	55 423	3 177	72 597
Other fuels[2]	$000	40 131	377	131	40 639
Total value of fuels	$000	283 374	95 245	65 770	444 389
Electricity purchased	million kWh	11 186	2 389	426	13 981
	$000	383 009	96 917	29 351	509 277
Total value of fuels and electricity purchased, all reporting companies	$000	666 384	192 162	95 121	953 687

Sources: Natural Resources Canada; Statistics Canada.
– Nil; . . . Amount too small to be expressed.
[1] Cement manufacturing, lime manufacturing, clay and clay products (domestic clays) are included in the mineral manufacturing industry. [2] Includes wood, manufactured gas, steam purchased, and other miscellaneous fuels.
Note: Numbers may not add to totals due to rounding.

TABLE 29. CANADA, COST OF FUEL AND ELECTRICITY USED IN THE NON-FUEL MINERAL INDUSTRY,[1] 1993-97

	Unit	1993	1994	1995	1996	1997
METALS						
Fuel	$000	194 325	207 602	237 376	289 723	283 375
Electricity purchased	million kWh	10 743	10 705	11 527	11 248	11 186
	$000	379 974	368 124	408 270	396 358	383 009
Total cost of fuel and electricity	$000	574 299	575 726	645 646	686 082	666 384
NONMETALS						
Fuel	$000	80 224	96 445	91 148	87 173	95 245
Electricity purchased	million kWh	2 102	2 301	2 383	2 333	2 389
	$000	96 528	108 050	109 676	107 876	96 917
Total cost of fuel and electricity	$000	176 752	204 496	200 824	195 049	192 162
STRUCTURAL MATERIALS						
Fuel	$000	33 610	42 830	58 609	84 772	65 770
Electricity purchased	million kWh	357	361	390	435	426
	$000	23 082	24 077	25 273	29 273	29 351
Total cost of fuel and electricity	$000	56 692	66 907	83 882	94 045	95 121
TOTAL NON-FUEL MINERAL INDUSTRY						
Fuel	$000	308 159	346 877	387 133	441 668	444 390
Electricity purchased	million kWh	13 202	13 387	14 270	14 016	13 981
	$000	501 584	500 252	543 219	533 507	509 277
Total cost of fuel and electricity	$000	809 743	847 129	930 353	975 176	953 687

Sources: Natural Resources Canada; Statistics Canada.
[1] Cement manufacturing, lime manufacturing, clay and clay products (domestic clays) are included in the mineral manufacturing industry.
Note: Numbers may not add to totals due to rounding.

TABLE 30. CANADA, EMPLOYMENT IN THE MINERAL INDUSTRY, STAGE I – MINERAL EXTRACTION AND CONCENTRATING (TOTAL ACTIVITY),[1] 1961-99

Year	Metal Mines	Nonmetal Mines	Structural Materials	Non-Fuel Minerals	Coal	Crude Oil and Natural Gas	Total Non-Fuel and Fuel Mineral Industries
SIC no.	061	062	081, 082	061, 062 081, 082	063	071	
				(number)			
1961	58 591	11 003	5 235	74 829	10 302	11 184	96 315
1962	58 243	11 408	5 514	75 165	9 897	11 232	96 294
1963	57 119	11 661	5 686	74 466	9 828	11 237	95 531
1964	57 648	11 727	6 044	75 419	9 796	11 242	96 457
1965	60 942	12 116	6 248	79 306	9 697	11 817	100 820
1966	61 670	12 422	6 312	80 404	9 281	12 378	102 063
1967	61 728	13 077	5 779	80 584	8 981	13 113	102 678
1968	63 369	13 673	5 836	82 878	8 427	13 611	104 916
1969	60 550	14 322	5 692	80 564	7 371	14 153	102 088
1970	66 590	15 150	5 510	87 250	7 874	14 970	110 094
1971	66 012	15 105	5 328	86 445	8 069	15 896	110 410
1972	61 994	14 866	5 154	82 014	8 704	16 604	107 322
1973	66 134	15 391	5 276	86 801	7 856	16 786	111 443
1974	70 038	16 198	6 197	92 433	8 142	18 155	118 730
1975	69 161	13 703	6 382	89 246	8 416	18 053	115 715
1976	68 269	15 649	5 685	89 603	8 995	19 096	117 694
1977	67 242	16 608	5 190	89 040	9 781	20 240	119 061
1978	56 447	16 035	4 847	77 329	10 574	22 045	109 948
1979	58 960	16 770	4 692	80 422	10 269	24 554	115 245
1980	66 118	16 979	4 461	87 558	11 416	27 448	126 422
1981	68 712	16 391	4 183	89 286	11 182	28 783	129 251
1982	61 503	13 680	3 491	78 674	13 113	31 699	123 486
1983	52 194	13 170	3 403	68 767	11 646	33 418	113 831
1984	52 683	13 696	3 560	69 941	11 905	33 944	115 790
1985	48 672	12 974	3 941	65 587	12 076	38 720	116 383
1986	46 487	12 376	4 887	63 750	10 747	34 936	109 433
1987	45 496	12 181	5 738	63 415	10 406	33 855	107 676
1988	48 277	11 679	5 917	65 873	11 122	33 762	110 757
1989	49 405	11 714	5 881	67 000	11 279	32 696	110 975
1990	45 248	11 515	5 376	62 139	11 017	31 926	105 082
1991	42 092	10 812	5 026	57 930	10 817	31 450	100 197
1992	37 774	10 419	4 338	52 531	9 726	27 678	89 935
1993	34 746	10 500	4 219	49 465	8 860	26 598	84 923
1994	33 380	10 627	5 300	49 307	8 886r	27 693	85 886r
1995	35 182	10 288	6 660	52 130	9 063r	26 491	87 684r
1996	34 257	9 620	6 501	50 378	9 177	34 939	94 494
1997	33 012	9 751	6 617	49 380	8 930	36 289	94 599
1998p	30 400	9 448	7 461	47 309	7 594	37 863	92 766
1999f	27 539	9 769	7 845	45 153	7 145	38 177	90 474

Sources: Natural Resources Canada; Statistics Canada.
SIC: Standard Industrial Classification, 1980.
f Forecast; p Preliminary; r Revised.
1 Total activity includes sales and head offices.

TABLE 31. CANADA, EMPLOYMENT IN THE NON-FUEL MINERAL INDUSTRY, STAGE I – MINERAL EXTRACTION AND CONCENTRATING (TOTAL ACTIVITY),[1] 1961-99

Year	Gold	Uranium	Iron	Nickel, Copper, Zinc	Silver, Lead, Zinc	Other Nonferrous	Asbestos	Peat	Gypsum	Potash	Salt	Misc. Nonmetals	Other Nonmetals	Stone Quarries	Sand and Gravel	Total Non-Fuel Mineral Industry
SIC no.	0611	0616	0617	0612, 0613	0614	0615, 0619	0621	0622	0623	0624	0625	0629	0625, 0629	081	082	
								(number)								
1961	15 994	(2)	8 446	23 351	4 524	6 276	6 773	1 207	599	(3)	(3)	(3)	2 424	3 173	2 062	74 829
1962	15 425	(2)	9 181	23 383	4 669	5 585	6 936	1 220	594	(3)	(3)	(3)	2 658	3 221	2 293	75 165
1963	14 639	(2)	9 608	22 703	5 163	5 006	6 828	1 303	677	(3)	(3)	(3)	2 853	3 477	2 209	74 466
1964	14 012	(2)	9 544	23 848	5 898	4 346	6 544	1 290	710	(3)	(3)	(3)	3 183	3 718	2 326	75 419
1965	13 155	(2)	11 739	25 892	6 121	4 035	6 536	1 201	646	1 050	(3)	(3)	2 683	3 511	2 737	79 306
1966	11 656	(2)	11 464	27 651	6 356	4 543	6 736	1 254	585	1 195	(3)	(3)	2 652	3 701	2 611	80 404
1967	10 355	(2)	10 899	29 288	6 030	5 156	6 931	1 261	505	1 724	(3)	(3)	2 656	3 381	2 398	80 584
1968	9 001	(2)	11 342	30 557	6 320	6 149	7 213	1 306	489	2 086	(3)	(3)	2 579	3 340	2 496	82 878
1969	8 221	(2)	10 490	28 679	6 467	6 693	7 242	1 156	657	2 713	(3)	(3)	2 554	3 252	2 440	80 564
1970	7 185	(2)	11 336	36 253	7 103	4 713	7 664	1 195	671	2 837	(3)	(3)	2 783	3 023	2 487	87 250
1971	6 148	(2)	11 524	37 713	6 506	4 121	8 101	1 269	603	2 519	(3)	(3)	2 613	2 832	2 496	86 445
1972	5 579	(2)	10 842	36 012	6 057	3 504	7 843	1 114	670	2 440	(3)	(3)	2 799	2 803	2 351	82 014
1973	5 603	(2)	13 395	37 602	6 112	3 422	8 027	1 236	676	2 684	(3)	(3)	2 768	3 097	2 179	86 801
1974	5 665	(2)	15 019	38 876	6 722	3 756	8 131	1 288	671	3 224	(3)	(3)	2 884	3 458	2 739	92 433
1975	5 798	(2)	16 155	35 538	7 362	4 308	6 042	1 303	576	3 351	(3)	(3)	2 431	3 544	2 838	89 246
1976	5 051	3 430	16 765	34 049	7 351	1 623	7 900	1 168	591	3 270	(3)	(3)	2 720	3 217	2 468	89 603
1977	4 643	4 140	15 550	33 703	7 512	1 694	8 302	1 244	652	3 628	(3)	(3)	2 782	3 004	2 186	89 040
1978	4 943	4 965	12 103	25 610	7 073	1 753	7 752	1 295	683	3 708	(3)	(3)	2 597	2 876	1 971	77 329
1979	5 013	5 858	14 563	25 116	7 081	1 329	8 067	1 372	738	3 905	(3)	(3)	2 688	2 860	1 832	80 422
1980	5 839	6 304	13 753	31 063	7 349	1 810	8 055	1 308	715	4 160	(3)	(3)	2 741	2 660	1 801	87 558
1981	6 809	6 869	12 397	33 246	7 740	1 651	6 829	1 441	711	4 661	(3)	(3)	2 749	2 418	1 765	89 286
1982	7 350	6 035	10 676	28 851	6 837	1 754	4 973	1 323	614	4 076	(3)	(3)	2 694	2 028	1 463	78 674
1983	7 956	5 390	8 236	24 953	5 073	586	4 617	1 301	682	3 696	(3)	(3)	2 874	1 980	1 423	68 767
1984	8 450	6 249	7 843	24 000	5 165	976	4 177	1 369	770	4 508	(3)	(3)	2 874	2 256	1 304	69 941
1985	7 862	5 969	7 077	22 073	4 724	947	3 569	1 363	753	4 488	(3)	(3)	2 801	2 340	1 601	65 587
1986	8 562	5 608	6 379	20 616	4 162	1 160	2 766	1 468	990	4 315	(3)	(3)	2 837	2 627	2 260	63 750
1987	9 757	5 289	6 039	18 979	4 372	1 060	2 858	1 510	929	4 094	(3)	(3)	2 790	2 911	2 827	63 415
1988	12 594	5 103	6 095	18 881	4 443	1 161	2 720	1 581	956	3 970	(3)	(3)	2 452	2 981	2 936	65 873
1989	12 631	4 839	6 303	19 837	4 487	1 308	2 800	1 713	965	3 893	(3)	(3)	2 343	3 145	2 736	67 000
1990	11 807	3 702	5 820	19 104	3 727	1 088	2 699	1 740	786	3 822	(3)	(3)	2 468	2 951	2 425	62 139
1991	10 869	2 391	5 683	18 634	3 459	1 056	2 423	1 519	636	3 825	1 575	834	2 409	2 774	2 252	57 930
1992	9 403	1 702	5 090	17 128	3 664	787	2 289	1 448	672	3 779	1 520	711	2 231	2 496	1 842	52 531
1993	8 810	1 467	4 648	15 892	3 134	795	2 253	1 624	698	3 657	1 547	721	2 268	2 448	1 771	49 465
1994	9 192	1 503	4 700	14 463	2 645	877	2 159	1 928	693	3 644	1 518	685	2 203	2 681	2 619	49 307
1995	9 849	1 530	4 852	15 059	2 898	994	x	1 951	689	3 573	1 433	x	x	2 981	3 679	52 130
1996	10 099	1 299	4 736	14 074	3 061	988	x	1 485	691	3 506	1 308	x	x	2 914	3 587	50 378
1997	9 621	1 024	4 839	13 478	3 058	992	x	1 536	651	3 444	1 466	x	x	2 965	3 652	49 380
1998p	8 188	985	4 903	12 600	2 734	990	x	1 665	660	3 396	1 498	x	x	3 121	4 340	47 309
1999f	7 417pr	892pr	4 442pr	11 414pr	2 477pr	897pr	x	1 722pr	682pr	3 511pr	1 549pr	x	x	3 531	4 314	45 153

Sources: Natural Resources Canada; Statistics Canada.
SIC: Standard Industrial Classification, 1980.
f Forecast; p Preliminary; pr Pro-rated; x Confidential.
1 Total activity includes sales and head offices. (2) Included in "Other Nonferrous." (3) Included in "Other Nonmetals."
Note: Numbers may not add to totals due to rounding.

TABLE 32. CANADA, EMPLOYMENT IN THE MINERAL INDUSTRY, STAGE II – SMELTING AND REFINING (TOTAL ACTIVITY),[1] 1961-99

Year	Smelting/ Refining	Iron and Steel Mills	Total Primary Metals	Petroleum Refineries	Total Smelting and Refining
SIC no.	295	291	291, 295	3611	
			(number)		
1961	29 938	34 749	64 687	10 660	75 347
1962	29 693	36 593	66 286	10 184	76 470
1963	28 516	38 196	66 712	9 734	76 446
1964	30 153	41 505	71 658	9 547	81 205
1965	31 835	44 274	76 109	8 976	85 085
1966	34 237	45 999	80 236	8 996	89 232
1967	34 764	44 203	78 967	9 147	88 114
1968	34 710	44 634	79 344	9 091	88 435
1969	33 376	42 954	76 330	8 765	85 095
1970	37 298	49 169	86 467	14 725	101 192
1971	36 445	49 601	86 046	14 506	100 552
1972	33 829	49 758	83 587	14 376	97 963
1973	32 396	53 008	85 404	14 843	100 247
1974	35 249	54 253	89 502	15 967	105 469
1975	35 577	54 003	89 580	15 624	105 204
1976	34 246	51 978	86 224	15 105	101 329
1977	35 647	52 709	88 356	16 464	104 820
1978	32 652	56 669	89 321	18 958	108 279
1979	32 869	59 167	92 036	18 037	110 073
1980	36 137	61 238	97 375	18 743	116 118
1981	38 011	56 543	94 554	21 325	115 879
1982	33 215	52 330	85 545	20 155	105 700
1983	31 788	47 693	79 481	17 557	97 038
1984	31 752	48 899	80 651	15 847	96 498
1985	30 567	47 685	78 252	15 326	93 578
1986	29 058	46 461	75 519	13 287	88 806
1987	29 397	46 493	75 890	13 252	89 142
1988	30 099	48 259	78 358	13 358	91 716
1989	30 651	46 738	77 389	13 881	91 270
1990	30 573	39 120	69 693	13 820	83 513
1991	28 817	38 126	66 943[a]	12 459	79 402
1992	27 837	35 268	63 105	11 032	74 137
1993	26 175	33 327	59 502	10 819	70 321
1994	24 231	33 097	57 328	10 262	67 590
1995	25 763	32 844	58 607	9 329	67 936
1996	26 529	32 190	58 719	9 303	68 022
1997	26 669	32 080	58 749	10 050	68 799
1998[e]	26 648	33 079	59 727	10 644[pr]	70 371
1999[f]	26 894	33 154	60 048	12 076[pr]	72 124

Sources: Natural Resources Canada; Statistics Canada.
SIC: Standard Industrial Classification, 1980.
[e] Estimated; [f] Forecast; [pr] Pro-rated.
[a] Change is partially due to the reclassification of a unit from SIC 295 to SIC 296 effective May 1991.
[1] Total activity includes sales and head offices.
Note: Numbers may not add to totals due to rounding.

TABLE 33. CANADA, EMPLOYMENT IN THE MINERAL INDUSTRY, STAGE III – SEMI-FABRICATION (TOTAL ACTIVITY),[1] 1961-99

Year	Total Non-Fuel Semi-Fabrication	Miscellaneous Petroleum and Coal Products	Lubricating Oil and Greases	Total Semi-Fabrication
SIC no.[2]		369	3612	
		(number)		
1961	77 063	581	331	77 975
1962	80 606	608	352	81 566
1963	82 420	635	354	83 409
1964	87 843	726	373	88 942
1965	93 912	531	408	94 851
1966	98 602	585	424	99 611
1967	96 033	546	407	96 986
1968	96 375	518	397	97 290
1969	99 438	532	438	100 408
1970	96 144	499	423	97 066
1971	95 831	561	450	96 842
1972	101 109	555	478	102 142
1973	105 884	757	487	107 128
1974	109 818	954	514	111 286
1975	104 296	984	656	105 936
1976	103 411	982	602	104 995
1977	101 257	716	669	102 642
1978	107 234	683	712	108 629
1979	111 231	461	695	112 387
1980	105 902	532	798	107 232
1981	103 192	584	729	104 505
1982	90 194	571	792	91 557
1983	86 814	503	857	88 174
1984	91 405	521	896	92 822
1985	94 515	513	900	95 928
1986	96 744	778	1 001	98 523
1987	99 963	894	1 002	101 859
1988	103 307	1 161	1 091	105 559
1989	101 419	1 135	1 029	103 583
1990	94 544	1 000	1 048	96 592
1991	87 091	1 138	1 046	89 275
1992	81 001	1 390	993	83 384
1993	79 389	1 401	1 864	82 654
1994	80 886	1 415	1 877	84 178
1995	83 931	1 444	1 569	86 944
1996	83 366	1 521	1 567	86 454
1997	89 513	1 468	1 272	92 253
1998e	95 571	1 903	1 347pr	98 820
1999f	96 950	2 038	1 528pr	100 516

Sources: Natural Resources Canada; Statistics Canada.
SIC: Standard Industrial Classification, 1980.
e Estimated; f Forecast; pr Pro-rated.
1 Includes sales and head offices. 2 1970 SIC for years 1961-82.
Note: Numbers may not add to totals due to rounding.

TABLE 34. CANADA, EMPLOYMENT IN THE MINERAL INDUSTRY, STAGE III – NON-FUEL SEMI-FABRICATION (TOTAL ACTIVITY),[1] 1961-99

Year	Steel Pipe and Tube	Iron Foundries	Aluminum Rolling, Casting, Extruding	Copper Rolling, Casting, Extruding	Other Rolling, Casting, Extruding	Wire and Wire Products	Clay and Clay Products	Cement	Concrete Products	Ready-Mix Concrete	Glass and Glass Products[2]	Abrasives	Lime	Other Non-metallic Products	Total Non-Fuel Semi-Fabrication
SIC no.	292	294	296	297	299	305	351	352	354	355	356	357	358	359	
								(number)							
1961	3 407	8 178	5 095	3 482	2 731	12 227	5 327	3 590	8 503	4 232	9 802	2 481	847	7 161	77 083
1962	3 676	8 546	5 118	3 492	2 770	13 045	5 468	3 679	9 156	4 586	10 042	2 577	949	7 202	80 606
1963	3 840	8 216	5 164	3 651	3 038	13 743	5 376	3 566	9 317	5 411	10 348	2 484	886	7 402	82 420
1964	4 437	9 620	4 834	3 849	3 382	14 850	5 582	3 592	10 225	6 171	10 362	2 580	815	7 544	87 843
1965	4 799	11 714	4 654	3 620	3 736	16 099	5 675	3 837	10 988	6 559	10 873	2 821	800	7 737	93 912
1966	4 795	13 027	4 943	4 199	4 103	16 391	5 876	4 053	11 090	7 349	11 248	3 044	785	7 899	98 602
1967	5 012	11 970	5 468	4 027	4 287	16 060	5 559	3 972	10 321	7 137	11 388	2 734	724	7 374	96 033
1968	5 441	11 131	5 491	3 947	4 585	16 082	5 515	3 747	10 166	7 440	11 992	2 617	662	7 559	96 375
1969	5 146	11 582	6 028	3 922	4 856	17 014	5 383	3 778	11 011	7 509	12 031	2 697	707	7 774	99 438
1970	5 314	10 663	6 297	3 744	4 060	16 598	4 938	3 887	9 562	7 340	11 654	2 559	660	8 868	96 144
1971	5 306	9 897	5 612	3 608	3 845	16 272	4 682	3 954	10 719	7 997	11 672	2 310	670	9 287	95 831
1972	6 268	9 948	6 200	3 740	4 215	17 651	4 695	4 732	10 817	8 240	12 045	2 367	651	9 540	101109
1973	5 288	10 965	6 206	3 736	4 863	18 877	5 001	4 871	10 790	9 233	12 840	2 555	724	9 935	105 884
1974	5 845	12 054	6 162	3 779	4 877	19 535	5 289	4 666	11 602	9 219	12 915	2 676	840	10 359	109 818
1975	5 785	11 480	5 672	3 240	4 573	17 614	5 042	4 577	11 201	9 541	11 779	2 318	790	10 684	104 296
1976	5 546	10 365	6 255	3 297	5 354	17 573	4 791	4 517	10 773	9 128	11 836	2 535	804	10 637	103 411
1977	5 834	10 459	6 884	3 183	4 703	17 886	4 553	4 265	10 001	8 521	11 204	2 557	828	10 579	101 257
1978	6 289	10 472	7 060	3 586	5 268	18 823	4 386	4 520	10 486	9 520	11 595	2 678	784	11 787	107 234
1979	6 480	10 520	7 098	3 728	6 292	19 765	4 947	4 828	9 786	9 332	11 835	2 660	925	12 456	111 231
1980	6 514	9 245	6 827	3 230	5 749	18 529	4 875	4 791	9 280	9 348	11 967	2 628	1 003	12 116	105 902
1981	7 531	8 358	6 512	3 031	5 182	17 309	4 145	4 726	9 121	10 053	12 003	2 571	968	11 682	103 192
1982	6 017	8 163	6 255	2 541	4 694	14 575	3 004	4 317	8 245	8 034	11 016	2 170	895	10 268	90 194
1983	4 521	7 364	6 415	2 744	4 827	13 493	3 008	4 057	7 286	8 390	11 896	1 852	862	10 099	86 814
1984	5 482	7 911	6 661	2 971	5 274	14 212	3 070	3 771	7 657	8 802	12 754	1 949	876	10 015	91 405
1985	5 978	7 750	6 196	3 012	5 620	15 354	2 727	3 533	8 336	9 210	12 872	1 895	783	11 249	94 515
1986	4 829	7 547	6 200	3 059	6 357	15 262	3 770	3 514	9 174	10 422	13 448	1 827	778	10 557	96 744
1987	4 964	7 860	6 143	2 828	6 403	14 943	3 930	3 646	10 309	11 910	13 605	1 693	784	10 945	99 963
1988	6 008	8 095	6 124	3 040	7 049	15 154	3 261	3 388	11 386	12 461	13 336	1 917	873	11 215	103 307
1989	5 438	7 538	6 285	3 119	6 645	15 077	3 044	3 350	11 505	12 377	12 664	2 039	871	11 467	101 419
1990	5 319	8 397	5 463	2 316	5 479	12 965	2 563	3 259	10 627	12 798	11 733	1 837	836	10 952	94 544
1991	5 618	7 680	5 169	2 211	4 710	12 369	2 254	3 111	9 442	11 633	10 855	1 408	861	9 770	87 091
1992	4 808	7 394	4 998	2 066	5 100	11 580	2 204	2 962	7 741	10 982	10 053	1 523	771	8 819	81 001
1993	5 555	7 174	5 128	2 111	4 946	11 814	1 686	2 786	7 387	10 438	9 676	1 395	731	8 562	79 389
1994	5 889	7 412	5 763	2 092	5 431	12 386	1 647	2 762	7 195	10 389	9 359	1 335	763	8 463	80 886
1995	5 675	7 736	5 713	2 023	6 043	13 249	1 762	2 784	8 000	10 233	9 542	1 451	793	8 927	83 931
1996	6 014	7 002	6 036	2 100	6 370	12 548	1 714	2 659	7 552	10 488	9 836	1 247	741	9 059	83 366
1997	6 589	7 375	6 240	2 533	7 819	13 322	1 911	2 664	8 550	10 963	9 835	1 299	812	9 601	89 513
1998•	6 852	7 839	6 469	2 796	7 933	14 610	2 063	2 956	8 766	12 082	10 560	1 402	877	10 365	95 571
1999f	7 289	7 392	6 417	2 721	8 218	14 677	2 112	2 971	9 019	12 687	10 502	1 436	897	10 611	96 950

Sources: Natural Resources Canada; Statistics Canada.
SIC: Standard Industrial Classification, 1980.
• Estimated; f Forecast.
1 Includes sales and head offices. 2 Includes sealed window manufacturers until 1969; thereafter, these are included in Stage IV – Ornamental Metal Products.
Note: Numbers may not add to totals due to rounding.

TABLE 35. CANADA, EMPLOYMENT IN THE MINERAL INDUSTRY, STAGE IV – METALLIC MINERAL MANUFACTURING (TOTAL ACTIVITY),[1] 1961-99

Year	Boilers	Structural Metal Products	Ornamental Metal Products	Stamped, Pressed and Coated Products	Hardware Tools and Cutlery	Heating Equipment	Machine Parts	Other Metal Fabricating	Total Mineral Manufacturing
SIC no.	301	302	303	304	306	307	308	309	
					(number)				
1961	4 709	14 231	10 641	21 156	9 135	5 137	7 756	15 249	88 014
1962	4 886	14 802	11 640	23 606	10 223	5 349	8 603	16 283	95 392
1963	5 350	14 212	12 459	24 024	11 112	5 586	9 179	16 627	98 549
1964	5 429	14 602	12 808	25 192	13 110	5 673	10 137	18 088	105 039
1965	6 496	18 072	13 439	27 925	13 570	5 711	11 618	20 017	116 848
1966	7 239	21 038	13 488	29 577	14 326	5 464	13 235	21 431	125 798
1967	6 622	18 547	12 994	29 830	14 056	5 461	13 810	21 007	122 327
1968	7 962	17 150	12 664	29 560	14 166	4 930	13 501	20 825	120 758
1969	7 494	18 203	12 784	30 463	14 401	5 059	14 517	20 895	123 816
1970	7 661	19 104	12 417	29 709	15 241	4 670	14 221	20 543	123 566
1971	7 847	17 556	12 614	28 710	14 920	4 749	13 097	20 755	120 248
1972	8 136	17 113	13 611	27 939	16 386	4 238	11 731	21 504	120 658
1973	8 013	18 164	13 937	30 026	18 819	4 453	10 138	22 494	126 044
1974	8 681	20 020	14 470	31 276	20 234	4 930	10 936	23 663	134 210
1975	10 211	19 101	15 241	30 273	18 990	4 717	10 922	23 810	133 265
1976	10 704	18 056	15 541	31 487	19 316	4 977	10 764	23 704	134 549
1977	9 660	17 209	14 800	30 888	17 867	4 538	10 762	23 298	129 022
1978	9 124	16 759	16 753	34 181	18 856	5 086	12 029	24 904	137 692
1979	9 477	18 676	18 018	33 548	21 090	5 818	13 081	23 705	143 413
1980	10 374	17 700	17 890	32 266	20 830	5 993	13 449	24 217	142 719
1981	11 215	18 445	17 603	32 459	19 575	5 806	14 297	22 123	141 523
1982	10 965	17 021	15 228	29 865	17 342	5 317	13 083	18 167	126 988
1983	5 413	18 437	13 537	27 947	16 609	5 032	12 881	16 044	115 900
1984	4 548	17 162	13 538	27 758	17 308	4 220	14 200	16 256	114 990
1985	4 455	18 083	15 598	31 021	19 297	5 607	15 356	14 927	124 344
1986	4 990	19 213	17 462	31 584	21 164	5 779	17 259	15 170	132 621
1987	4 816	18 615	19 770	35 329	22 129	6 252	18 398	16 358	141 667
1988	6 182	19 689	20 795	36 976	23 042	6 390	22 681	17 887	153 642
1989	5 407	23 006	22 591	36 707	25 626	7 076	24 639	20 099	165 151
1990	5 234	21 277	21 075	33 665	22 475	6 112	24 271	19 298	153 407
1991	5 081	18 667	19 885	30 348	21 912	5 246	23 092	16 770	141 001
1992	5 557	15 236	16 523	28 512	19 084	4 187	18 374	15 312	122 785
1993	5 277	14 769	14 554	28 396	20 051	4 463	18 840	14 442	120 792
1994	5 167	15 342	14 484	29 518	21 716	4 919	21 290	15 630	128 066
1995	5 012	17 706	14 501	31 562	22 704	5 280	24 691	17 258	138 714
1996	3 278	18 461	15 037	30 615	23 088	4 836	26 180	16 386	137 881
1997	3 735	21 381	16 172	35 622	27 082	5 413	30 500	20 195	160 100
1998e	3 514	24 054	17 242	36 026	30 083	5 774	30 812	21 571	169 076
1999f	3 907	25 379	18 595	37 207	30 315	6 395	31 575	23 367	176 740

Sources: Natural Resources Canada; Statistics Canada.
SIC: Standard Industrial Classification, 1980.
e Estimated; f Forecast.
1 Total activity includes sales and head offices.
Note: Numbers may not add to totals due to rounding.

TABLE 36. CANADA, EMPLOYMENT FOR SERVICES INCIDENTAL TO MINES, QUARRIES AND OIL WELLS, 1961-99[a]

Year	Petroleum and Natural Gas Contract Drilling	Mining Diamond Drilling	Other Services Incidental to Mines, Quarries and Oil Wells	Total
		(number)		
1961	4 144	2 025	1 409	7 578
1962	3 800	1 926	1 720	7 446
1963	4 179	2 201	1 491	7 871
1964	4 158	2 401	2 077	8 636
1965	4 648	2 776	3 137	10 561
1966	4 428	2 887	4 317	11 632
1967	4 249	2 669	5 425	12 343
1968	4 434	2 985	6 350	13 769
1969	4 821	3 109	6 967	14 897
1970	4 267	3 207	7 894	15 368
1971	4 093	2 514	7 710	14 317
1972	4 817	2 083	6 139	13 039
1973	5 680	2 123	5 193	12 996
1974	5 054	2 317	5 017	12 388
1975	5 096	1 899	4 139	11 134
1976	5 486	1 548	5 043	12 077
1977	6 054	1 682	5 723	13 459
1978	7 419	1 681	7 492	16 592
1979	9 076	2 420	8 436	19 932
1980	11 097	2 959	9 327	23 383
1981	8 448	2 721	9 856	21 025
1982	6 882	1 880	7 752	16 514
1983	12 032	1 575	12 254	25 861
1984	33 577	1 684	10 602	45 863
1985	37 516	1 625	12 191	51 332
1986	31 480	2 198	11 582	45 260
1987	30 400	3 353	11 174	44 928
1988	32 376	3 201	12 384	47 961
1989	29 017	2 072	11 052	42 141
1990	28 138	1 848	9 540	39 525
1991	29 909	1 395	8 606	39 910
1992	23 074	1 143	6 957	31 174
1993	25 426	1 515	6 284	33 225
1994	32 909	1 744	7 810	42 463
1995	28 177	1 832	8 041	38 050
1996	26 354	2 155	8 488	36 998
1997	32 150	2 124	8 738	43 012
1998[p]	35 000	1 569	7 750	44 318
1999[f]	31 951	1 569	7 064	40 584

Sources: Natural Resources Canada; Statistics Canada.
SIC: Standard Industrial Classification, 1980.
[f] Forecast; [p] Preliminary.
[a] From 1961 to 1983, Petroleum and Natural Gas Contract Drilling included SIC Code 0911, Mining Diamond Drilling included SIC Code 0921, and Other Services Incidental to Mines, Quarries and Oil Wells included both SIC Codes 0919 and 0929. For data beginning in the year 1984, these series changed. Petroleum and Natural Gas Contract Drilling includes both SIC Codes 0911 and 0919, Mining Diamond Drilling includes SIC Code 0921, and Other Services Incidental to Mines, Quarries and Oil Wells includes SIC Code 0929 only.
Note: Numbers may not add to totals due to rounding.

TABLE 37. CANADA, EMPLOYMENT, SALARIES AND WAGES IN THE MINERAL INDUSTRY,[1] 1990-97

	Unit	1990	1991	1992	1993	1994	1995	1996	1997
METALS									
Production and related workers	Number	33 895	31 168	27 908	25 762	24 809	26 344	25 830	25 121
Salaries and wages	$000	1 674 050	1 627 254	1 532 118	1 374 090	1 376 286	1 500 141	1 533 204	1 578 374
Average annual salary and wage	$	49 389	52 209	54 899	53 338	55 475	56 944	59 357	62 830
Administrative and office workers	Number	11 353	10 924	9 886	8 984	8 571	8 838	8 427	7 891
Salaries and wages	$000	603 486	626 302	587 210	532 735	526 076	558 984	554 226	548 854
Average annual salary and wage	$	53 157	57 333	59 519	59 298	61 379	63 248	65 767	69 554
Total metals									
Employees	Number	45 248	42 092	37 774	34 748r	33 380	35 182	34 257	33 012
Salaries and wages	$000	2 277 536	2 253 556	2 119 328	1 906 825	1 902 362	2 059 125	2 087 430	2 127 228
Average annual salary and wage	$	50 335	53 539	56 105	54 879	56 991	58 528	60 934	64 438
NONMETALS[2]									
Production and related workers	Number	8 736	8 055	7 938	7 974	8 094	7 855	7 232	7 456
Salaries and wages	$000	300 325	301 481	313 175	316 207	336 277	348 297	331 027	353 466
Average annual salary and wage	$	34 378	37 428	39 453	39 655	41 548	44 086	45 772	47 406
Administrative and office workers	Number	2 779	2 757	2 481	2 526	2 533	2 433	2 388	2 295
Salaries and wages	$000	125 740	133 255	122 356	125 008	124 704	127 452	129 484	141 808
Average annual salary and wage	$	45 246	48 333	49 317	49 489	49 232	52 385	54 223	61 789
Total nonmetals									
Employees	Number	11 515	10 812	10 419	10 500	10 627	10 288	9 620	9 751
Salaries and wages	$000	426 064	434 736	435 531	441 215	460 981	473 749	460 511	495 274
Average annual salary and wage	$	37 001	40 209	41 802	42 020	43 378	46 049	47 870	50 792
MINERAL FUELS (COAL)									
Production and related workers	Number	8 961	8 775	7 804	7 204	7 272	7 423	7 534r	7 369
Salaries and wages	$000	398 043	391 289	319 110	334 274	371 788	384 630	418 016	426 500
Average annual salary and wage	$	44 419	44 591	40 891	46 401	51 126	51 816	55 483r	57 877
Administrative and office workers	Number	2 056	2 042	1 922	1 656	1 618	1 640	1 643r	1 561
Salaries and wages	$000	95 426	103 853	98 604	85 078	87 713	93 402	93 808r	91 538
Average annual salary and wage	$	46 413	50 858	51 303	51 376	54 278	56 952	57 095r	58 640
Total mineral fuels									
Employees	Number	11 017	10 817	9 726	8 860	8 888r	9 063r	9 177	8 930
Salaries and wages	$000	493 469	495 142	417 714	419 352	459 490r	478 032r	511 824	518 038
Average annual salary and wage	$	44 792	45 774	42 948	47 331	51 699r	52 745r	55 772	58 010
STRUCTURAL MATERIALS									
Production and related workers	Number	3 966	3 644	3 169	3 113	3 908	5 106	4 958	5 085
Salaries and wages	$000	138 400	126 030	114 101	115 333	143 405	190 206	184 265	192 815
Average annual salary and wage	$	34 897	34 586	36 005	37 049	36 695	37 251	37 180	37 918
Administrative and office workers	Number	1 413	1 382	1 169	1 106	1 382	1 554	1 545	1 532
Salaries and wages	$000	55 682	53 655	50 121	46 068	53 559	61 363	62 342	62 996
Average annual salary and wage	$	39 407	38 824	42 875	41 653	38 476	39 487	40 350	41 120
Total structural materials									
Employees	Number	5 376	5 026	4 338	4 219	5 300	6 660	6 501	6 617
Salaries and wages	$000	194 081	179 685	164 222	161 401	196 964	251 569	246 607	258 811
Average annual salary and wage	$	36 101	35 751	37 857	38 256	37 183	37 773	37 933	38 659
TOTAL MINERAL INDUSTRY									
Production and related workers	Number	55 558	51 642	46 819	44 053	44 083	46 728	45 552r	45 013
Salaries and wages	$000	2 510 817	2 446 055	2 278 504	2 139 903	2 227 755	2 421 274	2 466 512	2 551 155
Average annual salary and wage	$	45 193	47 366	48 668	48 576	50 535	51 816	54 147r	56 653
Administrative and office workers	Number	17 601	17 105	15 438	14 272	14 112	14 465	14 003r	13 279
Salaries and wages	$000	880 333	917 064	858 290	788 890	792 052	841 201	839 860r	845 196
Average annual salary and wage	$	50 016	53 614	55 596	55 275	56 128	58 154	59 977r	63 649
Total mineral industry									
Employees	Number	73 156	68 747	62 247	58 325	58 195r	61 193r	59 555	58 310
Salaries and wages	$000	3 391 151	3 363 119	3 136 794	2 928 793	3 019 806r	3 262 475r	3 306 372	3 396 351
Average annual salary and wage	$	46 355	48 920	50 385	50 215	51 890r	53 315r	55 517	58 248

Sources: Natural Resources Canada; Statistics Canada.
r Revised.
[1] Cement manufacturing, lime manufacturing, clay and clay products (domestic clays) are included in the mineral manufacturing industry. [2] Includes structural materials.
Notes: This table no longer includes data for the petroleum and natural gas industries. Numbers may not add to totals due to rounding.

TABLE 38. CANADA, NUMBER OF WAGE EARNERS EMPLOYED IN THE NON-FUEL MINERAL INDUSTRY (SURFACE, UNDERGROUND AND MILL), 1990-97

	1990	1991	1992	1993	1994	1995	1996	1997
				(number)				
METALS								
Surface	8 608	7 545	6 550	5 973	4 526	4 467	6 358	4 762
Underground	14 454	13 614	12 205	11 281	11 396	12 305	10 610	11 556
Mill	10 833	10 009	9 153	8 508	8 888	9 572	8 862	8 803
Total	33 895	31 168	27 908	25 762	24 810	26 344	25 830	25 121
NONMETALS								
Surface	2 039	1 719	1 785	1 912	1 945	1 796	1 702	1 794
Underground	2 309	2 214	2 125	2 098	2 093	1 967	1 926	1 964
Mill	4 388	4 122	4 028	3 964	4 056	4 092	3 604	3 698
Total	8 736	8 055	7 938	7 974	8 094	7 855	7 232	7 456
STRUCTURAL MATERIALS								
Surface	3 348	3 181	2 768	2 708	3 373	4 573	4 349	4 391
Underground	–	–	–	–	–	–	–	–
Mill	618	463	401	405	535	533	607	694
Total	3 966	3 644	3 169	3 113	3 908	5 106	4 956	5 085
TOTAL NON-FUEL MINERAL INDUSTRY								
Surface	13 995	12 445	11 103	10 593	9 844	10 836	12 409	10 947
Underground	16 763	15 828	14 330	13 379	13 489	14 272	12 536	13 520
Mill	15 839	14 594	13 582	12 877	13 479	14 197	13 073	13 195
Total	46 597	42 867	39 015	36 849	36 812	39 305	38 018	37 662

Source: Natural Resources Canada.
– Nil.
Note: Numbers may not add to totals due to rounding.

TABLE 39. CANADA, MINE AND MILL WORKERS, BY SEX, EMPLOYED IN THE NON-FUEL MINERAL INDUSTRY, 1997

	Mine Workers				Mill Workers		Total	
	Underground		Surface					
	Male	Female	Male	Female	Male	Female	Male	Female
				(number)				
METALS								
Gold	4 000	35	1 078	29	1 996	69	7 074	133
Silver-lead-zinc	1 077	6	426	22	547	35	2 050	63
Uranium	135	18	196	6	390	38	721	62
Iron ore	25	–	966	19	2 642	105	3 633	124
Nickel-copper-zinc[1]	6 126	37	1 513	62	2 609	104	10 248	203
Miscellaneous metal mines[2]	97	–	437	8	256	12	790	20
Total	11 460	96	4 616	146	8 440	363	24 516	605
NONMETALS								
Asbestos	150	–	687	–	671	9	1 508	9
Peat	–	–	426	23	837	37	1 263	60
Gypsum	119	–	294	–	130	3	543	3
Potash	1 208	18	19	1	1 223	40	2 450	59
Miscellaneous nonmetal mines[3]	468	1	336	8	730	18	1 534	27
Total	1 945	19	1 762	32	3 591	107	7 298	158
STRUCTURAL MATERIALS								
Stone	–	–	1 773	17	470	16	2 243	33
Sand and gravel	–	–	2 513	88	205	3	2 718	91
Total	–	–	4 286	105	675	19	4 961	124
Total non-fuel mineral industry[4]	13 405	115	10 664	283	12 706	489	36 775	887

Source: Natural Resources Canada.
– Nil.
[1] Includes copper-zinc and nickel-copper mines. [2] Includes molybdenum mines. [3] Includes salt mines. [4] Coal data are not available.

TABLE 40. CANADA, LABOUR COSTS FOR METAL MINES IN RELATION TO TONNES MINED, 1995-97

	Number of Wage Earners	Total Wages	Average Annual Wage	Tonnage of Ore Mined	Average Annual Tonnes Mined Per Wage Earner	Wage Cost Per Tonne Mined
	(no.)	($000)	($)	(000 tonnes)	(tonnes)	($)
1995						
Uranium	639	33 163	51 898	1 364	2 135	24.31
Gold	5 265	305 233	57 974	25 120	4 771	12.15
Silver-lead-zinc	1 350	70 554	52 263	10 295	7 626	6 .85
Nickel-copper-zinc[1]	8 131	462 806	56 919	113 260	13 929	4 .09
Miscellaneous metals[2]	382	18 005	47 132	14 899	39 002	1.21
Iron ore	1 005	78 680	78 289	95 538	95 063	0.82
Total	16 772	968 441	57 742	260 475	15 530	3.72
1996						
Uranium	527	28 245	53 595	1 333	2 530	21.18
Gold	5 350	330 486	61 773	30 901	5 775	10.70
Silver-lead-zinc	1 553	83 214	53 583	11 656	7 505	7.14
Nickel-copper-zinc[1]	8 182	463 280	56 622	98 671	12 059	4.70
Miscellaneous metals[2]	382	20 020	52 407	14 659	38 374	1.37
Iron ore	974	76 455	78 496	95 783	98 339	0.80
Total	16 968	1 001 699	59 035	253 003	14 910	3.96
1997						
Uranium	355	23 408	65 937	979	2 757	23.91
Gold	5 142	353 561	68 759	33 924	6 597	10.42
Silver-lead-zinc	1 531	71 962	47 003	9 608	6 275	7.49
Nickel-copper-zinc[1]	7 738	465 700	60 183	94 892	12 263	4.91
Miscellaneous metals[2]	542	28 061	51 772	14 166	26 136	1.98
Iron ore	1 010	80 658	79 859	94 430	93 495	0.85
Total	16 318	1 023 349	62 712	247 999	15 197	4.13

Source: Natural Resources Canada.
[1] Includes copper-zinc and nickel-copper mines. [2] Includes molybdenum mines.

TABLE 41. CANADA, PERSON-HOURS PAID FOR PRODUCTION AND RELATED WORKERS, AND TONNES OF ORE MINED AND ROCK QUARRIED IN METAL MINES AND OTHER MINERAL OPERATIONS, 1992-97

	Unit	1992	1993	1994	1995	1996	1997
METAL MINES[1]							
Ore mined	Mt	248.2	236.5	233.7	260.5	253.0	248.0
Person-hours paid[2]	million	61.1	55.5	53.7	57.1	56.1	54.6
Person-hours paid per tonne mined	number	0.25	0.23	0.23	0.22	0.22	0.22
Tonnes mined per person-hour paid	t	4.06	4.26	4.35	4.56	4.50	4.54
OTHER MINERAL OPERATIONS[3]							
Ore mined and rock quarried	Mt	147.8	151.7r	170.5	173.0	167.9	178.4
Person-hours paid[2]	million	30.1	32.2r	32.2	33.3	32.1	32.2
Person-hours paid per tonne mined	number	0.20	0.21r	0.19	0.19	0.19	0.18
Tonnes mined per person-hour paid	t	4.91	4.71r	5.29	5.20	5.23	5.54

Sources: Natural Resources Canada; Statistics Canada, catalogue nos. 26-223, 26-224 and 26-206.
r Revised.
[1] Excludes placer mining. [2] Person-hours paid for production and related workers only. [3] Includes asbestos, potash, gypsum, salt, miscellaneous nonmetals, and coal.

TABLE 42. CANADA, AVERAGE WEEKLY WAGES (INCLUDING OVERTIME) FOR HOURLY RATED EMPLOYEES IN THE MINING, MINERAL MANUFACTURING, AND LOGGING AND FORESTRY INDUSTRIES, 1991-99

	1991	1992	1993	1994	1995	1996	1997	1998	1999
					($)				
Mines, quarries and oil wells	902.75	929.47	953.46	960.83	991.43	1 039.08	1 057.61	1 111.82r	1 112.94
Mining	893.99	934.52	946.41	972.67	1 013.75	1 051.24	1 036.86	1 101.80	1 086.39
Metal mines	928.68	972.31	988.59	1 016.75	1 068.15	1 109.27	1 084.60	1 165.36	1 160.28
Nonmetal mines	760.42	795.46	802.00	830.51	845.53	871.52	910.50	920.56	907.39
Quarries and sand pits	650.78	672.02	640.86	669.64	724.13	746.72	781.99	845.45	813.94
Coal mines	897.50	933.84	946.45	956.98	990.84	1 015.54	994.15	1 071.30	1 041.82
Crude petroleum and natural gas	1 110.13	1 098.68	1 148.77	1 165.58	1 202.52	1 243.35	1 252.89	1 297.23	1 327.51
Logging and forestry	682.45	700.07	712.49	733.88	735.30	768.63	793.12	767.91	774.65
Manufacturing	624.70	652.92	669.44	685.84	694.58	716.62	736.69	755.92	755.86

Source: Statistics Canada.
r Revised.

TABLE 43. CANADA, NUMBER OF STRIKES AND LOCKOUTS BY INDUSTRY, 1997-99

	1997			1998			1999p		
	Strikes and Lockouts	Workers Involved	Duration in Person-Days	Strikes and Lockouts	Workers Involved	Duration in Person-Days	Strikes and Lockouts	Workers Involved	Duration in Person-Days
					(number)				
Agriculture	–	–	–	–	–	–	1	11	60
Logging and forestry	1	9	710	4	4 897	476 680	7	2 002	118 290
Fishing and trapping	–	–	–	–	–	–	–	–	–
Mining	7	6 175	164 100	7	771	92 060	8	2 676	150 580
Manufacturing	112	23 003	778 280	113	22 997	597 268	129	25 887	514 252
Construction	–	–	–	15	11 242	325 840	8	1 014	6 420
Transportation and utilities	39	48 728	594 660	29	5 771	108 180	43	36 215	685 540
Trade	30	11 160	461 190	41	1 767	43 140	43	2 421	78 755
Finance, insurance and real estate	4	73	2 070	14	1 364	38 798	13	499	39 650
Service	78	140 177	1 537 166	134	182 697	670 400	125	81 859	641 984
Public administration	12	3 337	46 600	21	3 884	82 150	36	6 028	210 190
Other industries	1	25 000	25 000	3	9 012	9 360	–	–	–
Total, all industries	284	257 662	3 609 776	381	244 402	2 443 876	413	158 612	2 445 721

Source: Human Resources Development Canada, Workplace Information Directorate.
– Nil; p Preliminary.

TABLE 44. CANADA, NUMBER OF STRIKES AND LOCKOUTS BY MINING AND MINERAL MANUFACTURING INDUSTRY, 1997-99

	1997			1998			1999p		
	Strikes and Lockouts	Workers Involved	Duration in Person-Days	Strikes and Lockouts	Workers Involved	Duration in Person-Days	Strikes and Lockouts	Workers Involved	Duration in Person-Days
					(number)				
MINING	7	6 175	164 100	7	771	92 060	8	2 676	150 580
Metals	3	6 087	154 840	3	488	76 440	4	2 174	137 280
Mineral fuels	–	–	–	1	100	100	–	–	–
Nonmetals	2	34	2 410	2	156	8 630	3	475	8 580
Quarries	2	54	6 850	1	27	6 890	1	27	4 720
MINERAL MANUFACTURING	11	2 383	86 420	14	1 400	21 130	15	2 515	27 470
Primary metals	6	1 588	64 190	6	1 081	4 160	6	1 926	17 370
Nonmetallic mineral products	5	795	22 230	8	319	16 970	9	589	10 100
Petroleum and coal products	–	–	–	–	–	–	–	–	–

Source: Human Resources Development Canada, Workplace Information Directorate.
– Nil; p Preliminary.

TABLE 45. CANADA, MINING WAGES AND SALARIES BY PROVINCE, TERRITORY AND MINERAL CLASS, 1996 AND 1997

Province/Territory	1996					1997				
	Metals	Nonmetals	Coal	Quarries and Sand Pits	Total	Metals	Nonmetals	Coal	Quarries and Sand Pits	Total
	($000)									
Newfoundland	168 242	x	–	x	170 078	175 643	x	–	x	178 382
Prince Edward Island	–	649	–	–	649	–	1 194	–	–	1 194
Nova Scotia	–	29 606	69 956	6 075	105 637	–	32 110	68 749	7 014	107 873
New Brunswick	x	x	4 245	4 548	135 672	x	x	3 300	4 219	131 733
Quebec	516 416	110 051	–	56 473	682 940	498 398	119 972	–	56 950	675 321
Ontario	665 665	63 678	–	104 341	833 684	704 014	66 731	–	105 248	875 993
Manitoba	199 222	4 561	–	7 149	210 933	204 266	4 571	–	7 383	216 221
Saskatchewan	x	178 364	x	4 244	274 792	x	205 619	x	4 312	313 675
Alberta	–	x	x	x	205 425	–	x	x	x	209 289
British Columbia	232 346	4 566	245 419	34 158	516 488	233 252	5 252	255 694	33 296	527 494
Yukon	x	–	–	x	38 176	x	–	–	x	24 852
Northwest Territories	x	–	–	–	x	x	–	–	x	134 345
Total	2 087 429	460 511	511 824	246 607	3 306 371	2 127 228	495 274	518 038	255 811	3 396 351

Sources: Natural Resources Canada; Statistics Canada.
– Nil; x Confidential.
1 Includes establishments primarily engaged in providing contract drilling and other services to petroleum and natural gas industries.
Note: This table no longer includes data for the petroleum and natural gas industries.

TABLE 46. CANADA, SOURCE OF ORES HOISTED OR REMOVED FROM SELECTED TYPES OF MINES, 1995-97

Mines	1995			1996			1997		
	Underground	Open-Pit	Total	Underground	Open-Pit	Total	Underground	Open-Pit	Total
	(000 tonnes)								
METALS									
Gold	18 740	8 381	25 120	18 684	12 217	30 901	18 060	15 864	33 924
Silver-lead-zinc	8 133	2 162	10 295	7 617	4 039	11 656	7 835	1 773	9 608
Uranium	1 283	81	1 364	922	411	1 333	535	444	979
Iron	845	94 693	95 538	731	95 052	95 783	663	93 767	94 430
Nickel-copper-zinc	26 839	86 421	113 260	28 851	69 820	98 671	26 504	68 388	94 892
Miscellaneous metals	924	13 975	14 899	1 073	13 586	14 659	1 059	13 107	14 166
Subtotal metals	54 762	205 713	260 475	57 879	195 124	253 003	54 656	193 343	247 999
NONMETALS									
Asbestos	x	x	x	x	x	x	x	x	x
Gypsum	916	7 708	8 623	933	7 651	8 584	1 114	8 027	9 141
Potash	40 196	–	40 196	34 103	–	34 103	38 932	–	38 932
Rock salt	9 854	–	9 854	11 226	–	11 226	12 690	–	12 690
Miscellaneous nonmetals	x	x	x	x	x	x	x	x	x
Subtotal nonmetals	52 722	19 874	72 596	48 025	19 466	67 491	54 671	21 982	76 653
MINERAL FUELS									
Coal	5 318	92 389	97 707	4 593	95 766	100 359	4 730	97 005	101 735
Total metals, nonmetals and mineral fuels	112 802	317 976	430 778	110 497	310 357	420 853	114 057	312 330	426 388
Percentage	26.2	73.8	100.0	26.3	73.7	100.0	26.7	73.3	100.0

Sources: Natural Resources Canada; Statistics Canada.
– Nil; x Confidential.
Note: Numbers may not add to totals due to rounding.

TABLE 47. CANADA, SOURCE OF MATERIAL HOISTED OR REMOVED FROM SELECTED TYPES OF MINES, 1997

	Underground		Open-Pit			
	Ore	Waste	Ore	Waste	Over-burden	Tailings
	(000 tonnes)					
METALS						
Gold	18 060	5 638	15 864	42 816	3 786	31 049
Silver-lead-zinc	7 834	746	1 773	2 966	–	7 982
Uranium	535	143	444	1 002	17	1 008
Iron	663	–	93 767	11 123	9 036	54 253
Nickel-copper-zinc	26 504	1 147	68 388	68 974	2 210	88 520
Miscellaneous metals	1 059	46	13 107	103 563	–	11 115
Subtotal metals	54 656	7 721	193 343	230 444	15 050	193 927
NONMETALS						
Asbestos	x	x	x	x	x	x
Gypsum	1 114	120	8 027	2 338	2 110	268
Potash	38 932	2 865	–	–	–	21 521
Rock salt	12 690	372	–	–	–	556
Miscellaneous nonmetals	x	x	x	x	x	x
Subtotal nonmetals	54 671	3 396	21 982	19 869	2 309	29 036
MINERAL FUELS						
Coal	4 730	. .	97 005	. .	. .	. .
Total metals, nonmetals and mineral fuels	114 057	11 117	312 330	250 313	17 359	222 963

Sources: Natural Resources Canada; Statistics Canada.
– Nil; . . Not available; x Confidential.
Note: Numbers may not add to totals due to rounding.

TABLE 48. CANADA, ORE MINED AND ROCK QUARRIED IN THE MINING INDUSTRY, 1993-97

	1993	1994	1995	1996	1997
	(000 tonnes)				
METALS					
Gold	19 285	21 288	25 120	30 901	33 924
Silver-lead-zinc	8 001	7 444	10 295	11 656	9 608
Uranium	1 663	1 756	1 364	1 333	979
Iron	78 741	95 723	95 538	95 783	94 430
Nickel-copper-zinc	116 277	92 651	113 259	98 671	94 892
Miscellaneous metals	12 496	14 887	14 899	14 659	14 166
Subtotal metals	236 464	233 748	260 475	253 003	247 999
NONMETALS					
Asbestos	x	x	x	x	x
Gypsum	8 472	8 944	8 623	8 584	9 141
Potash	30 811	38 846	40 196	34 103	38 932
Rock salt	10 350	11 758	9 854	11 226	12 690
Miscellaneous nonmetals	x	x	x	x	x
Subtotal nonmetals	64 143	73 864	72 596	67 491	76 653
STRUCTURAL MATERIALS					
Stone, all kinds quarried	105 998	110 411	120 660	112 420	120 953
Sand and gravel	237 205	247 148	230 098	217 361	227 315
MINERAL FUELS					
Coal	87 603	96 616	97 707	100 359	101 735
Total ore mined and rock quarried	731 413	761 787	781 536	750 634	774 655

Sources: Natural Resources Canada; Statistics Canada.
x Confidential
Note: Numbers may not add to totals due to rounding.

TABLE 49. CANADA, ORE MINED AND ROCK QUARRIED IN THE MINING INDUSTRY, 1961-97

Year	Metals	Industrial Minerals[1]	Coal	Total
		(million tonnes)		
1961	90.1	96.7	. .	186.8
1962	103.6	103.8	. .	207.4
1963	112.7	120.4	. .	233.1
1964	128.0	134.1	. .	262.1
1965	151.0	146.5	. .	297.5
1966	147.6	171.8	. .	319.4
1967	169.1	177.5	. .	346.6
1968	186.9	172.7	. .	359.6
1969	172.0	178.8	. .	350.8
1970	213.0	179.1	. .	392.1
1971	211.5	185.8	. .	397.3
1972	206.0	189.7	. .	395.7
1973	274.9	162.6	. .	437.4
1974	278.7	178.8	. .	457.5
1975	264.2	158.7	. .	422.9
1976	296.5	167.1	. .	463.6
1977	299.5	205.2	33.8	538.5
1978	248.1	205.5	36.3	489.9
1979	274.8	200.1	39.8	514.6
1980	290.1	193.5	43.9	527.5
1981	301.5	172.5	48.2	522.2
1982	238.4	121.2	53.0	412.5
1983	219.0	137.0	54.8	410.8
1984	246.4	167.8	71.2	485.4
1985	245.0	171.9	76.7	493.6
1986	256.3	179.1	72.7	508.2
1987	266.2	197.5	77.5	541.1
1988	282.1	210.3	89.3	581.6
1989	283.8	209.4	87.7	580.9
1990	280.6	195.4	89.5	565.4
1991	271.4	166.4	90.3	528.0
1992	248.2	169.2	81.4	498.8
1993	236.5	167.9	87.6	458.4
1994	233.7	184.3	96.6	514.6
1995	260.5	193.3	97.7	551.4
1996	253.0	179.9	100.4	533.3
1997	248.0	197.6	101.7	547.3

Sources: Natural Resources Canada; Statistics Canada.
. . Not available.
[1] Includes nonmetallic mineral mining and all stone quarried, including stone used to make cement and lime. From 1979 onwards, coverage includes miscellaneous nonmetal mines previously excluded.
Note: Numbers may not add to totals due to rounding.

TABLE 50. CANADA, CRUDE MINERALS TRANSPORTED BY CANADIAN RAILWAYS, 1996-98

	1996	1997	1998
		(000 tonnes)	
METALLIC MINERALS			
Iron ores and concentrates	37 381	38 790	39 032
Alumina and bauxite	3 661	5 301	5 091
Nickel and nickel-copper ores and concentrates	3 499	3 221	3 182
Zinc ores and concentrates	1 265	1 154	601
Copper ores and concentrates	1 057	991	1 160
Lead ores and concentrates	148	105	46
Metallic ores and concentrates, n.e.s.	338	360	492
Subtotal	47 349	49 922	49 604
NONMETALLIC MINERALS			
Potash (KCl)	12 246	14 205	13 869
Gypsum	5 297	5 384	5 003
Sulphur, n.e.s.	5 210	5 704	5 120
Sulphur, liquid	1 623	1 654	1 787
Salt, rock	1 847	1 889	1 848
Limestone, n.e.s.	1 302	1 446	1 584
Phosphate rock	1 023	1 046	1 088
Sodium carbonate	311	402	386
Nepheline syenite	312	317	328
Sodium sulphate	264	218	200
Limestone, industrial	144	164	98
Sand, industrial	151	147	128
Clay	102	116	133
Nonmetallic minerals, n.e.s.	117	112	97
Salt, n.e.s.	81	50	50
Limestone, agricultural	134	145	241
Stone, n.e.s.	76	82	173
Abrasives, natural	6	6	5
Barite	2	1	1
Silica	3	4	2
Asbestos	1	2	1
Sand, n.e.s.	4	1	1
Peat and other mosses	–	5	4
Subtotal	30 255	33 100	32 147
MINERAL FUELS			
Coal, bituminous	39 470	32 123	37 253
Coal, lignite	989	1 562	1 925
Natural gas and other crude bituminous substances	72	63	98
Oil, crude	3	3	1
Coal, n.e.s.	–	1	–
Subtotal	40 533	33 754	39 277
Total crude minerals	118 137	116 777	121 029
Total revenue freight[1] moved by Canadian railways	252 081	268 088	259 277
Crude minerals as a percentage of total revenue freight	46.9	43.6	46.7

Source: Statistics Canada.
– Nil; n.e.s. Not elsewhere specified.
[1] Revenue freight refers to a local or interline shipment from which earnings accrue to a carrier.
Note: Numbers may not add to totals due to rounding.

TABLE 51. CANADA, FABRICATED MINERAL PRODUCTS TRANSPORTED BY CANADIAN RAILWAYS, 1996-98

	1996	1997	1998
		(000 tonnes)	
METALLIC MINERAL PRODUCTS			
Ferrous mineral products			
Iron and steel scrap	1 554	3 593	1 494
Sheets and strips, steel	1 091	1 297	975
Bars and rods, steel	858	819	771
Ingots, blooms, billets, slabs, iron and steel	691	682	752
Pipes and tubes, iron and steel	377	402	719
Structural shapes and sheet piling, iron and steel	191	307	375
Plates, steel	378	282	264
Rails and railway track material	197	70	63
Castings and forgings, iron and steel	61	78	74
Pig iron	21	20	32
Ferroalloys	19	19	16
Other primary iron and steel	3	8	24
Wire, iron or steel	2	. . .	. . .
Subtotal ferrous mineral products	5 444	7 576	5 559
Nonferrous mineral products			
Aluminum and aluminum alloy fabricated material, n.e.s.	881	947	988
Zinc and alloys	539	533	566
Aluminum paste, powder, pigs, ingots, shot	294	426	416
Copper and alloys, n.e.s.	402	361	417
Other nonferrous base metals and alloys	401	458	473
Lead and alloys	144	112	91
Slag, dross, etc.	46	140	75
Nonferrous metal scrap	35	5 637	38
Copper matte and precipitates	19	9	7
Subtotal nonferrous mineral products	2 761	8 624	3 071
Total metallic mineral products	8 205	16 200	8 630
NONMETALLIC MINERAL PRODUCTS			
Fertilizers and fertilizer materials, n.e.s.	2 772	2 976	2 949
Sulphuric acid	2 339	2 358	2 514
Portland cement, standard	1 840	1 973	1 885
Lime, hydrated and quick	203	175	146
Cement and concrete basic products, n.e.s.	261	274	413
Nonmetallic mineral basic products, n.e.s.	132	187	141
Natural stone basic products, chiefly structural	126	124	196
Asbestos and asbestos-cement basic products	20	17	14
Gypsum basic products, n.e.s.	146	167	235
Dolomite and magnesite, calcined	25	27	23
Refractories, n.e.s.	–	1	7
Fire brick and similar shapes	7	5	2
Plaster	–	–	–
Glass basic products	–	1	–
Bricks and tiles, clay	3	1	3
Total nonmetallic mineral products	7 873	8 287	8 528
MINERAL FUEL PRODUCTS			
Refined and manufactured gases, fuel type	1 381	1 132	4 262
Fuel oil, n.e.s.	492	404	549
Diesel fuel	763	745	1 033
Gasoline	975	1 421	1 486
Other petroleum and coal products	639	769	1 148
Coke, n.e.s.	373	381	1 322
Petroleum coke	318	429	360
Lubricating oils and greases	258	364	384
Asphalts and road oils	370	406	448
Total mineral fuel products	5 569	6 052	10 993
Total fabricated mineral products	21 647	30 539	28 151
Total revenue freight[1] moved by Canadian railways	252 081	268 088	259 277
Fabricated mineral products as a percentage of total revenue freight	8.6	11.4	10.9

Source: Statistics Canada.
– Nil; . . . Amount too small to be expressed; n.e.s. Not elsewhere specified.
1 Revenue freight refers to a local or interline shipment from which earnings accrue to a carrier.
Note: Numbers may not add to totals due to rounding.

TABLE 52. CANADA, CRUDE MINERALS AND FABRICATED MINERAL PRODUCTS TRANSPORTED BY CANADIAN RAILWAYS, 1961-98

Year	Total Revenue Freight[1]	Total Crude Minerals	Total Fabricated Mineral Products	Total Crude and Fabricated Minerals	Crude and Fabricated Minerals as a Percentage of Revenue Freight
		(million tonnes)			(%)
1961	138.9	54.1	13.6	67.7	48.7
1962	146.0	60.3	13.8	74.1	50.8
1963	154.6	62.9	15.5	78.4	50.6
1964	180.0	74.6	15.9	90.5	50.3
1965	186.2	80.9	17.3	98.2	52.7
1966	194.5	80.6	17.8	94.8	50.6
1967	190.0	81.2	17.7	98.9	52.1
1968	195.4	86.7	18.8	105.5	54.0
1969	189.0	81.9	27.6	109.5	57.9
1970	211.6	97.5	28.4	125.9	59.5
1971	214.5	95.6	27.4	123.0	57.3
1972	215.8	89.4	27.6	117.0	54.2
1973	241.2	113.1	29.1	142.2	59.0
1974	246.3	115.3	30.9	146.2	59.4
1975	226.0	110.6	26.6	137.2	60.7
1976	238.5	116.6	25.5	142.1	59.6
1977	247.2	121.1	25.7	146.8	59.4
1978	238.8	107.7	26.2	133.9	56.1
1979	257.9	127.2	26.6	153.8	59.6
1980	254.4	124.8	24.6	149.4	58.7
1981	246.6	120.7	26.4	147.1	59.7
1982	212.5	95.7	21.0	116.7	54.9
1983	222.8	95.3	22.7	118.0	53.0
1984	254.6	121.1	25.1	146.2	57.4
1985	250.6	125.2	24.3	149.5	59.7
1986	249.8	121.2	23.0	144.2	57.7
1987	261.4	122.2	22.7	144.9	55.4
1988	269.4	134.9	23.2	158.1	58.7
1989	247.0	122.3	23.1	145.4	58.9
1990	226.3	112.1	20.1	132.2	58.4
1991	233.3	114.4	19.1	133.5	57.2
1992	226.2	102.8	20.9	123.7	54.7
1993	224.0	100.8	21.4	122.3	54.6
1994	253.6	112.6	21.4	134.0	52.8
1995	253.7	118.4	22.0	140.5	55.4
1996	252.1	118.1	21.6	139.8	55.5
1997	268.1	116.8	30.5	147.3	55.0
1998	259.3	121.0	28.2	149.2	57.5

Source: Statistics Canada.
1 Revenue freight refers to a local or interline shipment from which earnings accrue to a carrier.

TABLE 53. CANADA, CRUDE MINERALS LOADED AND UNLOADED IN COASTWISE SHIPPING, 1998

	Loaded					Unloaded				
	Atlantic	St. Lawrence	Great Lakes	Pacific	Total	Atlantic	St. Lawrence	Great Lakes	Pacific	Total
	(tonnes)									
METALLIC MINERALS										
Copper and nickel ores and concentrates	25 819	–	–	–	25 819	–	25 819	–	–	25 819
Iron ore and concentrates	–	6 982 071	–	–	6 982 071	–	1 241 208	5 740 863	–	6 982 071
Aluminum ores and concentrates	–	33 818	–	–	33 818	–	–	33 818	–	33 818
Other ores and concentrates	–	2 910 184	331 994	–	3 242 178	–	2 931 653	310 525	–	3 242 178
Total metallic minerals	25 819	9 926 073	331 994	–	10 283 886	–	4 172 861	6 085 206	–	10 283 886
NONMETALLIC MINERALS										
Salt	1 429 451	–	1 742 832	48 500	3 220 783	404 935	1 540 154	1 227 194	48 500	3 220 783
Limestone	324 036	66 692	1 622 345	748 894	2 761 967	66 692	324 036	1 622 345	748 894	2 761 967
Sand and gravel	90 755	–	142 476	1 118 997	1 352 228	90 755	24 235	118 241	1 118 997	1 352 228
Gypsum	815 260	–	–	78 199	893 459	175 977	428 302	210 981	78 199	893 459
Potash	–	–	53 982	–	53 982	–	20 076	33 906	–	53 982
Sulphur	–	–	–	6 552	6 552	–	–	–	6 552	6 552
Other mineral products (including clays, coal briquettes, greases and asphalt)	382 824	109 801	2 573 581	201 903	3 268 109	202 905	521 247	2 342 054	201 903	3 268 109
Total nonmetallic minerals	3 042 326	176 493	6 135 216	2 203 045	11 557 080	941 264	2 858 050	5 554 721	2 203 045	11 557 080
MINERAL FUELS										
Coal and coke	16 792	–	788 506	–	805 298	16 792	163 673	624 833	–	805 298
Crude petroleum	711 365	–	–	–	711 365	218 999	492 366	–	–	711 365
Total mineral fuels	728 157	–	788 506	–	1 516 663	235 791	656 039	624 833	–	1 516 663
Total crude minerals	3 796 302	10 102 566	7 255 716	2 203 045	23 357 629	1 177 055	7 712 769	12 264 760	2 203 045	23 357 629
Total all commodities[1]	7 281 981	13 896 477	14 423 664	12 325 377	47 927 503	5 317 004	14 727 942	15 530 469	12 352 089	47 927 503
Crude minerals as a percentage of all products	52.1	72.7	50.3	17.9	48.7	22.1	52.4	79.0	17.8	48.7

Source: Statistics Canada.
– Nil.
1 Includes metallic minerals, nonmetallic minerals and mineral fuels, along with all other cargo loaded and unloaded in coastwise shipping.
Note: Numbers may not add to totals due to rounding.

TABLE 54. CANADA, FABRICATED MINERAL PRODUCTS LOADED AND UNLOADED IN COASTWISE SHIPPING, 1998

	Loaded					Unloaded				
	Atlantic	St. Lawrence	Great Lakes	Pacific	Total	Atlantic	St. Lawrence	Great Lakes	Pacific	Total
					(tonnes)					
METALLIC MINERAL PRODUCTS										
Iron, steel and alloys	6 261	61 713	–	10 500	78 474	6 718	615	60 641	10 500	78 474
Aluminum and aluminum products	–	176 677	–	–	176 677	–	176 677	–	–	176 677
Other base-metal products	286	40 029	–	–	40 314	1 721	38 593	–	–	40 314
Total metallic mineral products	6 548	278 419	–	10 500	295 485	8 439	215 885	60 641	10 500	295 485
NONMETALLIC MINERAL PRODUCTS										
Cement and related products	7 711	99 000	425 448	29 987	562 156	7 711	4 709	519 749	29 987	562 156
Other fabricated nonmetallic minerals, n.e.s.	145 408	19 007	39 292	137 849	341 556	49 792	126 825	27 091	137 849	341 557
Total nonmetallic mineral products	153 119	118 016	464 740	167 836	903 711	57 503	131 533	546 840	167 836	903 712
MINERAL FUEL PRODUCTS										
Gasoline	1 010 928	552 516	248 676	258 802	2 070 922	1 133 587	352 298	323 746	261 292	2 070 923
Other fabricated mineral fuels, n.e.s.	1 794 170	1 802 715	1 077 341	197 694	4 871 920	1 890 766	1 906 009	852 263	222 884	4 871 922
Total mineral fuel products	2 805 098	2 355 231	1 326 017	456 496	6 942 842	3 024 353	2 258 307	1 176 009	484 176	6 942 845
Total fabricated mineral products	2 964 763	2 751 666	1 790 757	634 832	8 142 018	3 090 295	2 605 725	1 783 490	662 512	8 142 022
Total all commodities[1]	7 281 981	13 896 477	14 423 664	12 325 377	47 927 503	5 317 004	14 727 942	15 530 469	12 352 089	47 927 503
Fabricated mineral products as a percentage of all commodities	40.7	19.8	12.4	5.2	17.0	58.1	17.7	11.5	5.4	17.0

Source: Statistics Canada.
– Nil; n.e.s. Not elsewhere specified.
1 Includes metallic mineral products, nonmetallic mineral products and mineral fuel products, along with all other cargo loaded and unloaded in coastwise shipping.
Note: Numbers may not add to totals due to rounding.

TABLE 55. CANADA, CRUDE MINERALS AND FABRICATED MINERAL PRODUCTS LOADED AT CANADIAN PORTS IN COASTWISE SHIPPING, 1961-98

Year	Total All Commodities[1]	Total Crude Minerals	Total Fabricated Minerals	Crude and Fabricated Minerals as a Percentage of All Products
		(000 tonnes)		(%)
1961	41 861	9 527	8 857	43.9
1962	39 763	8 361	9 768	45.6
1963	40 328	7 998	9 942	44.5
1964	47 171	8 522	11 194	41.8
1965	48 200	9 183	11 766	43.5
1966	55 122	10 155	12 653	41.4
1967	49 799	11 509	12 207	47.6
1968	50 921	13 698	13 245	52.9
1969	51 890	12 746	14 181	51.9
1970	57 301	14 415	14 818	51.0
1971	55 128	14 783	15 374	54.7
1972	55 326	14 197	15 290	53.3
1973	55 314	16 573	15 615	58.2
1974	53 633	11 723	16 575	52.8
1975	54 373	15 687	17 510	61.1
1976	53 882	15 924	16 208	59.6
1977	58 309	18 131	17 435	61.0
1978	60 668	18 318	16 619	57.6
1979	79 950	22 130	17 486	49.6
1980	82 761	22 947	17 134	48.4
1981	71 271	17 849	16 669	48.4
1982	65 881	16 473	13 214	45.1
1983	67 598	21 248	12 025	49.2
1984	68 698	22 798	11 909	50.5
1985	61 717	19 867	10 291	48.9
1986	60 506	19 901	10 264	49.9
1987	67 572	20 969	11 118	47.5
1988	69 974	23 325	11 676	50.0
1989	62 016	22 963	11 825	56.1
1990	60 360	22 430	16 096	63.8
1991	58 430	19 624	10 370	51.3
1992	52 262	22 125	9 325	60.2
1993	49 976	21 088	8 168	58.5
1994	51 534	21 221	9 510	59.6
1995	50 370	20 626	8 825	58.5
1996	48 829	22 393	7 634	61.5
1997	46 639	20 298	7 461	59.5
1998	47 928	23 358	8 142	65.7

Source: Statistics Canada.

1 Includes metallic mineral products, nonmetallic mineral products and mineral fuel products, along with all other cargo loaded and unloaded in coastwise shipping.

TABLE 56. CANADA, CRUDE MINERALS LOADED AND UNLOADED AT CANADIAN PORTS IN INTERNATIONAL SHIPPING TRADE,[1] 1996-98

	1996		1997		1998	
	Loaded	Unloaded	Loaded	Unloaded	Loaded	Unloaded
	(tonnes)					
METALLIC MINERALS						
Iron ore and concentrates	29 536 169	7 788 860	32 875 255	8 033 932	30 793 211	7 631 659
Aluminum ores and concentrates	28 567	2 601 690	81 200	2 771 756	84 099	2 912 687
Lead and zinc ores and concentrates	849 908	519 920	924 026	452 714	990 191	560 450
Copper and nickel ores and concentrates	812 201	248 098	751 545	218 313	712 123	383 969
Other ores and base-metal products	1 594 910	364 193	1 329 312	332 979	2 065 168	250 453
Total metallic minerals	32 821 755	11 522 761	35 961 338	11 809 694	34 644 792	11 739 218
NONMETALLIC MINERALS						
Limestone	2 396 173	3 474 739	2 654 250	3 096 455	2 843 399	2 979 514
Sand and gravel	1 073 325	1 203 973	1 537 271	793 206	857 713	782 724
Gypsum	5 577 586	314 928	6 157 811	457 371	6 301 586	509 495
Salt	3 504 958	1 082 158	3 493 441	1 094 266	4 187 659	989 121
Sulphur	5 191 846	19 824	5 512 305	534	5 231 603	86
Potash	5 786 119	22 101	6 117 530	28	4 764 411	18
Other mineral products (including clays, coal briquettes, greases and asphalt)	1 981 952	3 005 900	4 925 802	2 805 177	5 895 738	3 112 470
Total nonmetallic minerals	25 511 959	9 123 623	30 398 410	8 247 037	30 082 109	8 373 428
MINERAL FUELS						
Coal and coke	34 176 597	12 633 941	36 549 641	15 081 228	33 682 218	19 443 252
Crude petroleum	4 441 733	26 174 392	8 073 655	30 364 239	9 310 254	27 903 439
Other mineral fuels	–	–	–	–	–	–
Total mineral fuels	38 618 330	38 808 333	44 623 296	45 445 467	42 992 472	47 346 691
Total crude mineral products	96 952 044	59 454 717	110 983 044	65 502 198	107 719 373	67 459 337
Total all commodities[1]	174 306 180	85 791 564	187 716 502	94 535 096	178 893 100	100 457 100
Crude minerals as a percentage of all commodities	55.6	69.3	59.1	69.3	60.2	67.2

Source: Statistics Canada.
– Nil.
1 Includes metallic minerals, nonmetallic minerals and mineral fuels, along with all other cargo loaded and unloaded at Canadian ports.
Note: Numbers may not add to totals due to rounding.

TABLE 57. CANADA, FABRICATED MINERAL PRODUCTS LOADED AND UNLOADED AT CANADIAN PORTS IN INTERNATIONAL SHIPPING TRADE,[1] 1996-98

	1996		1997		1998	
	Loaded	Unloaded	Loaded	Unloaded	Loaded	Unloaded
	(tonnes)					
METALLIC MINERAL PRODUCTS						
Iron, steel and alloys	1 357 807	2 719 410	1 451 001	3 638 383	1 249 954	5 065 678
Nonferrous metals, n.e.s.	1 063 039	3 891 720	1 047 466	3 914 078	1 030 974	4 253 307
Total metallic mineral products	2 420 846	6 611 130	2 498 467	7 552 461	2 280 928	9 319 185
NONMETALLIC MINERAL PRODUCTS						
Cement and related products	3 154 880	196 940	2 739 896	375 340	3 453 497	675 398
Other nonmetallic minerals, n.e.s.	2 250 694	1 469 196	2 142 140	1 747 880	2 272 853	1 801 768
Total nonmetallic mineral products	5 405 574	1 666 136	4 882 036	2 123 220	5 726 350	2 477 166
MINERAL FUEL PRODUCTS						
Gasoline	4 124 542	1 740 355	4 114 237	1 958 796	3 963 390	1 788 736
Fuel oil	3 626 419	2 066 515	3 955 310	2 635 535	3 808 619	3 340 323
Coke, petroleum and coal products	321 018	1 087 596	573 595	1 009 136	518 117	1 071 178
Other mineral fuels, n.e.s.	2 681 191	818 069	2 443 171	1 363 522	121 098	676 223
Total mineral fuel products	10 753 170	5 712 535	11 086 313	6 966 989	8 411 224	6 876 458
Total fabricated mineral products	18 579 590	13 989 801	18 466 816	16 642 670	16 418 502	18 672 809
Total all commodities[1]	174 306 180	85 791 584	187 716 502	94 535 096	178 893 100	100 457 100
Fabricated mineral products as a percentage of all commodities	10.7	16.3	9.8	17.6	9.2	18.6

Source: Statistics Canada.
n.e.s. Not elsewhere specified.
1 Includes metallic mineral products, nonmetallic mineral products and mineral fuel products, along with all other cargo loaded and unloaded at Canadian ports.
Note: Numbers may not add to totals due to rounding.

TABLE 58. CANADA, CRUDE MINERALS AND FABRICATED MINERAL PRODUCTS LOADED AT CANADIAN PORTS IN INTERNATIONAL SHIPPING TRADE, 1961-98

Year	Total All Commodities[1]	Total Crude Minerals	Total Fabricated Minerals	Crude and Fabricated Minerals as a Percentage of All Products
		(000 tonnes)		(%)
1961	48 771	23 241	2 133	52.0
1962	54 676	30 446	2 296	59.9
1963	62 031	32 214	2 503	56.0
1964	75 760	42 087	2 602	59.0
1965	74 521	41 338	2 746	59.2
1966	76 192	41 374	3 350	58.7
1967	72 598	42 704	3 701	63.9
1968	78 663	48 680	2 960	65.6
1969	70 432	42 442	3 456	65.2
1970	95 807	55 849	4 965	63.5
1971	95 887	53 245	5 022	60.8
1972	98 988	51 912	9 091	61.6
1973	112 434	64 195	10 103	66.1
1974	106 110	64 093	9 041	68.9
1975	102 444	61 970	7 495	67.8
1976	114 815	71 527	6 108	67.6
1977	119 770	70 257	5 979	63.7
1978	116 522	62 291	7 556	59.9
1979	134 639	79 685	8 901	65.8
1980	138 161	67 898	11 770	57.7
1981	145 445	83 007	9 022	63.3
1982	125 282	65 594	7 115	58.0
1983	129 490	67 152	6 197	56.6
1984	145 322	82 752	7 986	62.4
1985	143 421	83 878	10 814	66.0
1986	144 561	84 720	8 303	64.3
1987	158 994	86 085	10 488	60.7
1988	171 064	98 934	12 227	65.0
1989	159 069	90 807	13 624	65.7
1990	159 039	88 504	15 107	65.1
1991	168 030	90 165	16 138	63.3
1992	153 786	78 600	14 643	60.6
1993	152 162	81 418	16 723	64.5
1994	169 463	94 423	15 725	65.0
1995	176 540	100 103	16 346	66.0
1996	174 306	96 952	18 580	66.3
1997	187 717	110 983	18 467	69.0
1998	178 893	107 719	16 419	69.4

Source: Statistics Canada.

1 Includes metallic mineral products, nonmetallic mineral products and mineral fuel products, along with all other cargo loaded and unloaded at Canadian ports.

TABLE 59. CANADA, CAPITAL AND REPAIR EXPENDITURES BY SELECTED INDUSTRIAL SECTOR, 1998-2000

		Capital Expenditures			Repair Expenditures[1]		
		Construction	Machinery and Equipment	Total	Construction	Machinery and Equipment	Total
		($ millions)					
Agriculture forestry, fishing and hunting	1998	1 600.2	3 108.8	4 709.0	709.8	2 439.1	3 148.9
	1999p	1 611.4	3 032.1	4 643.4	..	..	..
	2000i	1 697.5	3 011.8	4 709.3	..	..	..
Mining[2]	1998	17 489.2	2 657.5	20 146.7	669.0	2 324.5	2 993.4
	1999p	15 707.5	2 510.2	18 217.7	..	..	..
	2000i	18 322.8	2 615.3	20 938.1	..	..	..
Manufacturing	1998	3 263.8	17 149.8	20 413.6	1 227.1	8 700.9	9 928.0
	1999p	3 177.1	17 075.2	20 252.3	..	..	..
	2000i	3 142.3	16 925.9	20 068.2	..	..	..
Construction	1998	303.8	2 773.5	3 077.3	64.5	1 060.2	1 124.7
	1999p	319.0	2 949.0	3 268.0	..	..	..
	2000i	335.1	3 089.9	3 425.0	..	..	..
Transportation and warehousing	1998	6 224.6	6 452.0	12 676.7	1 497.9	4 038.0	5 535.9
	1999p	6 867.9	6 894.8	13 762.7	..	..	..
	2000i	6 059.1	5 615.2	11 674.3	..	..	..
Utilities	1998	4 803.4	3 099.9	7 903.3	875.5	1 306.8	2 182.2
	1999p	4 797.6	3 324.7	8 122.4	..	..	..
	2000i	5 002.3	2 971.6	7 973.9	..	..	..
Wholesale and retail trade	1998	2 108.0	4 707.1	6 815.2	486.1	1 081.0	1 567.1
	1999p	2 329.8	4 381.5	6 711.3	..	..	..
	2000i	2 364.0	4 334.0	6 697.8	..	..	..
Housing	1998	37 414.6	–	37 414.6	5 083.2	–	5 083.2
	1999p	40 909.5	–	40 909.5	..	..	..
	2000i	42 986.2	–	42 986.2	..	..	..
Total[3]	1998	95 445.7	71 931.2	167 376.9	16 125.6	25 097.8	41 223.4
	1999p	99 773.7	74 559.4	174 332.8	..	..	..
	2000i	104 775.4	71 776.7	176 552.1	..	..	..
Mining as a percentage of total	1998	18.3	3.7	12.0	4.1	9.3	7.3
	1999p	15.7	3.4	10.4	..	..	..
	2000i	17.5	3.6	11.9	..	..	..

Source: Statistics Canada.
– Nil; . . Not available; i Intentions; p Preliminary actual.
1 Repair data are not available for 1999 and 2000. 2 Includes mines, quarries and oil wells. 3 Includes finance, real estate, insurance, commercial services, institutions and government departments.
Notes: Numbers may not add to totals due to rounding. Capital and repair expenditures are based on the 1980 Standard Industrial Classification.

TABLE 60. CANADA, CAPITAL AND REPAIR EXPENDITURES IN THE MINERAL INDUSTRY[1] BY PROVINCE AND TERRITORY, 1998-2000

Province/ Territory		Capital Expenditures			Repair Expenditures[2]		
		Construction	Machinery and Equipment	Total	Construction	Machinery and Equipment	Total
		($ millions)					
Newfoundland	1998	1 045.8	54.1	1 099.9	x	x	x
	1999p	1 448.4	53.5	1 501.9	. .	. .	. .
	2000i	1 251.2	27.1	1 278.3	. .	. .	. .
Nova Scotia	1998	1 040.0	52.9	1 092.9	x	x	19.4
	1999p	1 277.3	51.1	1 328.5	. .	. .	. .
	2000i	495.7	31.4	527.1	. .	. .	. .
New Brunswick	1998	x	x	110.3	x	x	94.9
	1999p	46.7	26.2	72.9	. .	. .	. .
	2000i	64.9	41.6	106.5	. .	. .	. .
Quebec	1998	546.6	118.0	664.6	32.3	337.0	369.3
	1999p	479.2	111.9	591.2	. .	. .	. .
	2000i	402.8	104.7	507.5	. .	. .	. .
Ontario	1998	509.6	228.8	738.4	42.6	325.9	368.5
	1999p	408.7	137.0	545.6	. .	. .	. .
	2000i	508.2	238.2	746.5	. .	. .	. .
Manitoba	1998	132.7	19.6	152.4	12.8	42.1	54.9
	1999p	110.7	13.7	124.4	. .	. .	. .
	2000i	160.0	29.0	189.0	. .	. .	. .
Saskatchewan	1998	1 389.3	224.5	1 613.8	60.4	150.5	210.9
	1999p	1 099.4	260.3	1 359.8	. .	. .	. .
	2000i	1 252.3	206.2	1 458.5	. .	. .	. .
Alberta	1998	10 634.6	1 716.6	12 351.1	450.5	848.5	1 299.0
	1999p	9 295.2	1 684.7	10 979.9	. .	. .	. .
	2000i	12 306.8	1 762.7	14 069.4	. .	. .	. .
British Columbia	1998	1 541.9	172.5	1 714.4	51.5	359.3	410.8
	1999p	1 236.6	139.2	1 375.8	. .	. .	. .
	2000i	1 516.9	141.4	1 658.3	. .	. .	. .
Yukon	1998	x	x		x	x	x
	1999p	20.7	1.9	22.6	. .	. .	. .
	2000i	26.5	4.4	30.9	. .	. .	. .
Northwest Territories	1998	549.0	31.3	580.3	2.2	44.4	46.5
	1999p	–	–	–	. .	. .	. .
	2000i	–	–	–	. .	. .	. .
Nunavut	1998	–	–	–	–	–	–
	1999p	x	x	x	. .	. .	. .
	2000i	x	x	x	. .	. .	. .
Total Canada	1998	17 489.2	2 657.5	20 146.7	669.0	2 324.5	2 993.4
	1999p	15 707.5	2 510.2	18 217.7	. .	. .	. .
	2000i	18 322.8	2 615.3	20 938.1	. .	. .	. .

Source: Statistics Canada.
. . Not available; p Preliminary actual; i Intentions; x Confidential.
1 Includes mines, quarries and oil wells. 2 Repair data are not available for 1999 and 2000.
Notes: Numbers may not add to totals due to rounding. Capital and repair expenditures are based on the 1980 Standard Industrial Classification.

TABLE 61. CANADA, CAPITAL AND REPAIR[1] EXPENDITURES IN THE MINING AND OIL AND GAS EXTRACTION INDUSTRIES, 1998-2000

	1998			1999[p]	2000[i]
	Capital	Repair	Total	Capital	Capital
			($ millions)		
MINERAL EXTRACTION					
Metal ore mining					
Gold and silver	523.3	290.2	813.5	447.8	397.1
Copper and copper-zinc	142.6	73.0	215.6	161.2	226.6
Nickel-copper	291.2	121.2	412.4	x	277.4
Lead-zinc	104.0	83.4	187.4	60.3	93.6
Uranium	x	x	x	x	x
Iron	146.1	214.7	360.8	177.3	175.7
Other metal mines	x	x	x	x	x
Total	1 527.2	936.9	2 464.1	1 300.3	1 465.8
Nonmetallic mineral mining					
Asbestos	x	x	x	x	x
Peat	44.0	14.0	57.9	28.8	18.5
Gypsum	x	x	x	x	x
Potash	109.5	104.4	213.9	93.2	98.5
Other nonmetal mines	482.4	53.5	535.9	123.5	87.0
Coal	238.6	325.2	563.9	187.0	156.3
Stone	89.0	67.2	156.2	58.1	43.7
Sand and gravel, clay, and ceramic and refractory	70.8	69.4	140.3	47.1	44.4
Total	1 120.80	697.3	1 818.1	605.1	509.2
Oil and gas extraction	16 194.5	860.6	17 055.1	15 203.5	17 840.6
Service industries incidental to mineral extraction	1 304.2	498.7	1 802.9	1 108.8	1 122.5
Total mineral industry	20 146.7	2 993.5	23 140.2	18 217.7	20 938.1

Source: Statistics Canada.
i Intentions; p Preliminary actual; x Confidential.
1 Repair data are not available for 1999 and 2000.
Notes: Numbers may not add to totals due to rounding. Capital and repair expenditures are based on the 1980 Standard Industrial Classification.

Definitions and Valuation: Mineral Production, Shipments and Trade

Mineral Statistics

The publication of statistics on the mineral production of Canada was instituted by the Geological and Natural History Survey of Canada as early as 1886. The Department of Mines carried out this compilation through the early part of the twentieth century. Subsequently, the work was transferred to Statistics Canada, which published the data for the period 1921 to 1978. In January 1979, the responsibility for Canadian non-fuel mineral statistics was transferred from Statistics Canada to the Department of Energy, Mines and Resources (now Natural Resources Canada). Statistics Canada retains responsibility for fuels and mineral manufacturing statistics (including cement, lime, clay, and smelting and refining).

The construction of new metallurgical plants and the development of new types of ore have resulted in changes in methods of compilation over the period but, in general, the following principles have been followed.

For nonmetallic minerals such as asbestos, talc, barite, etc., and for structural materials such as stone, cement, etc., the mine or quarry shipments are taken to represent production. Usually there is little difference between actual output and mine shipments, and it is more convenient and practical to measure the product at the latter point. Values are computed on the f.o.b. shipping point basis and they represent, therefore, the amounts actually received by the producers. Values are adjusted to exclude the costs of containers, taxes, duties, sales discounts and outward-bound transportation.

Production data for certain simple metallic ores such as iron ore, uranium, etc., are compiled in a similar manner, that is, products shipped from a specific shipping point at f.o.b. values. For some metals this is not practical and an attempt is made to measure output in terms of recoverable metals in concentrates shipped, which are then valued at current market prices.

The value of metallic mineral production calculated in this manner does not coincide with the amounts actually received by the producers.

Details of the Methods Used in Computing the Mineral Production of Canada

Metallic Mineral Production

Antimony
Production includes recoverable antimony in concentrates shipped. The value is calculated using the yearly average New York dealer price.

Bismuth
Production includes recoverable bismuth in concentrates shipped. The value is calculated using the yearly average New York dealer price.

Cadmium
Cadmium is associated with zinc. Production includes the recoverable content of cadmium in the zinc-lead concentrates shipped, valued at the yearly average New York dealer price.

Calcium
Output figures represent calcium metal plus the calcium content of alloys from Canadian sources valued at the average yearly price of metal crowns.

Cesium
Production figures represent the cesium oxide content of pollucite ore shipped. The value is as reported by the producer.

Cobalt
Production includes recoverable cobalt in concentrates shipped. The value is calculated using the average yearly cathode dealer spot prices.

Copper
Production includes recoverable copper in concentrates shipped. The value is calculated using a combination of the Commodities Exchange, Inc. (COMEX) first position price and the average London Metal Exchange Grade A Settlement price.

Germanium
Production includes germanium contained in concentrates shipped with values as reported by the shipper.

Gold
Production includes gold in crude bullion obtained directly from placer workings and lode gold mines, and recoverable gold in all types of ores and concentrates shipped. The value is calculated using the average final price as established by bullion dealers in London.

Ilmenite
Production includes shipments of direct shipping grade ore at Canada's sole shipper's reported value.

Indium
Production includes quantities recovered in the smelting of silver-lead-zinc ores from Canadian sources. The output is valued by the shipper.

Iron Ore
Production figures represent product shipments (pellets, concentrates, ores) at the values shown by the shippers. Production from steel plant waste oxides is excluded.

Iron (Remelt)
This is sometimes called pig iron or Sorel iron. It is a co-product in the smelting of ilmenite ores. Quantity and value figures are those reported by the producer.

Lead
Production includes recoverable lead in concentrates shipped. The value is computed at the average producer price for the year.

Lithium
Production figures represent the lithium oxide content of spodumene and amblygonite ore shipped. The value is as reported by the producer.

Magnesium
Output figures represent magnesium metal, plus the magnesium content of alloys from Canadian sources. Values are compiled using the average yearly price of primary ingots.

Molybdenum
Production figures are the molybdenum content of the oxides, ferromolybdenum and sulphides shipped; the value is that shown by the shipper.

Nickel
Production includes recoverable nickel in concentrates shipped. The value is calculated using an assessment price based on London Metal Exchange prices.

Niobium (Columbium)
Production includes niobium (columbium) contained in concentrates shipped with values as reported by the shipper.

Platinum Group Metals (PGM)
Production figures for iridium, palladium, platinum, ruthenium and rhodium include recoverable metal in concentrates exported. The quantities are valued at the average New York dealer price for the year.

Rhenium
Production figures reflect the content of concentrates shipped. Values are those reported by the shipper.

Rubidium
Production figures include the content of concentrates shipped. Values are as reported by the shipper.

Selenium
Production includes selenium produced as a refinery by-product from Canadian sources and recoverable selenium contained in concentrates exported. The quantities are valued at the average New York dealer price for the year.

Silver
Production includes silver in crude bullion obtained directly from placer workings and lode gold mines, and recoverable silver in all types of ores and concentrates shipped. The value is calculated using the average of Toronto quotations for the year.

Tantalum
Production comprises the tantalum pentoxide content of concentrates shipped as valued by the shipper.

Tellurium
Production includes tellurium produced as a refinery by-product from Canadian sources and recoverable tellurium contained in concentrates exported. The quantities are valued at the average producers' price for the year.

Tin
Production figures comprise recoverable tin in tin concentrates shipped. The value is based on the average New York dealer price for the year.

Uranium
Producers of uranium precipitates or concentrates report the metal content (U) of the shipments and the value is calculated by Natural Resources Canada.

Zinc
Production comprises recoverable zinc in concentrates shipped. The value is calculated using the average London Metal Exchange price for the year.

Nonmetallic Mineral Production

Owing to the fact that it is difficult to obtain figures of the actual production of nonmetallic minerals in Canada, and since the first actual measurement is when the product is sold, plant shipments have been taken to represent production in all cases.

Barite
Production is the shipments of the various grades at the selling value, f.o.b. shipping points.

Chrysotile (Asbestos)
Production figures represent shipments of the various grades at the total selling value, f.o.b. shipping points, less the value of containers.

Diamonds
Production is shipments from the mine. The value is calculated by Natural Resources Canada.

Gemstones
Production is the tonnage of crude and rough cut amethyst, jade and labradorite shipped at its selling value, f.o.b. shipping points.

Graphite
Production is the shipments of various grades from the mill at its selling value, f.o.b. the mill, less container costs.

Gypsum
Production is taken as the tonnage of crude gypsum and anhydrite shipped from quarries or mines in lump, crushed or fine-ground forms. The value is that reported by the operators. (Note: Gypsum used in the manufacture of cement in Canadian cement plants is excluded.)

Magnesitic Dolomite (Magnesite)
Production is the tonnage of crude material sold by primary producers, plus the tonnage of calcined or dead-burned material sold or consumed by primary producers. The value is that reported by the producers.

Marl
Production is producers' shipments from the plant. Values, f.o.b. plant, are reported by the producer.

Mica
Production is recorded as shipments from plants dressing new mica, and exported shipments directly from the mines. The value of shipments is taken as reported by operators.

Nepheline Syenite
Production of crude and ground nepheline syenite is the amount of the various grades shipped at the total selling value, f.o.b. works, less container costs.

Peat
Production comprises crude peat shipped to Canadian non-producers as fuel or for export, baled peat shipped, and the peat content of mixed products shipped. Value is the sales value, f.o.b. works, less the cost of containers.

Potash
Production represents producers' shipments of various grades from the plant and is measured as the K_2O equivalent. The value of shipments, f.o.b. plant, is reported by the producers.

Potassium Sulphate
Production is producers' shipments from the plant. Values, f.o.b. plant, are reported by the producer.

Pumice
Production is producers' shipments from the plant. Values, f.o.b. plant, are reported by the producer.

Quartz (Silica)
Production represents the tonnage of crude or pulverized quartz, quartzite, pure silica sand, or other natural silica material shipped for sale, plus the tonnage of any of these materials consumed by producers. The value is taken as reported by producers.

Salt
Production is taken as the tonnage of various grades of dry salt shipped by primary producers, plus the salt content of brine used by producers for industrial (chemical) purposes. The value is that reported by producers.

Serpentine
Production represents producers' shipments of various grades valued f.o.b. plant, as reported by the producer.

Soapstone, Talc, Pyrophyllite
Production comprises crude, ground or sawn soapstone shipments; crude, milled or refined talc shipments; and crude or ground pyrophyllite shipments. All shipments are f.o.b. the mill or plant and are valued by the shipper.

Sodium Sulphate
Production is the tonnage of crude or refined natural sodium sulphate shipped at its selling value, f.o.b. shipping points. The figures exclude the sodium sulphate produced as a by-product of paper or rayon manufacturing.

Sulphur in Smelter Gas
Prior to final metal recovery, sulphide concentrates are smelted or roasted and the resultant gases may be used to produce marketable sulphur, sulphur dioxide or sulphuric acid. Production is considered as the sulphur content of sulphuric acid made, sulphur dioxide marketed and sulphur shipped. This sulphur is valued at the average price for sulphur sold in acid. Production is shown by province of origin of concentrates.

Sulphur, Elemental
In the western provinces, sour natural gas is processed to remove hydrogen sulphide, which is further reduced to yellow elemental sulphur. Sulphur recovered from the refining of Canadian crude petroleum is also included. Production is shown by province of origin of material and values are as reported by the shippers.

Titanium Dioxide
Ilmenite ore is smelted at Sorel, Quebec, to produce a slag containing titanium dioxide. Production is the

titanium dioxide content of slag valued by the producer.

Tremolite
Production is shipments of various grades at the selling values, f.o.b. shipping point, less the value of containers.

Zeolite
Production is shipments from the plant. Values are f.o.b. plant, as reported by the producer.

Fuels

Coal
Production figures are equal to shipments from the mine/plant plus "own" consumption as valued by shippers, f.o.b. mine/plant.

Natural Gas
Production figures represent sales of natural gas from dry gas fields after field uses, losses and reinjection, but before inventory changes. Values are as reported by the producers.

Natural Gas By-Products
Production figures for propanes, butanes, etc., represent the quantity that is available for market. It is the quantity produced by gas processing plants after processing and reprocessing plant uses, losses and shrinkage. Values are selling value, f.o.b. shipping points.

Oil, Crude and Equivalent
Production figures represent the production of crude oil from both conventional and non-conventional sources after field use, losses and reinjection. Values are those reported by shippers, f.o.b. well head or plant.

Structural Materials

Cement
Production comprises shipments of Portland and masonry cements, exported clinker, and transfers to other corporate divisions for use in other manufacturing processes. Values are f.o.b. plant, as reported by the shipper.

Clay Products
Production represents shipments of brick and other clay products made from domestic clays, and shipments of unmanufactured clays (bentonite, diatomite) at the total selling value, f.o.b. works, as reported by the operators. Data relating to clay products manufactured from imported clays are not included.

Lime
Production represents the tonnage of hydrated and quicklime shipped (sold by the producer) together with the tonnage of these limes produced and consumed by the producers of chemicals and allied products. The values are as reported by the producer.

Sand and Gravel
Production represents shipments of natural gravel, sand and crushed gravel at the values reported by operators of sand and gravel pits or dredges.

Stone
Production represents quarry shipments of crude or undressed stone, crushed stone and dressed stone, if the latter is prepared by the quarry operators at values as reported by the operators. The figures include data for both private and public or municipally owned properties. Production figures do not include dressed stone prepared from imported stone or prepared from domestic stone in works not at the quarries.

To avoid duplication in computing a total value for Canadian mineral production, the quantity and value of stone consumed in the manufacture of lime, cement and clay products are not included in the totals for stone production. These particular data are recorded separately and are published in conjunction with data for the lime, cement and clay industries.

VALUATION OF TRADE DATA

(Note: The following has been extracted from Statistics Canada catalogue no. 65-003.)

For Customs purposes, imports are recorded at values established according to the provisions of the *Customs Act* which, since January 1, 1985, reflects valuation methods based on the General Agreement on Tariffs and Trade (GATT) Valuation Code System. It generally requires that the value for duty of imported goods be equivalent to the transaction value or the price actually paid.

To determine the transaction value of imported goods, all transportation and associated costs arising in respect of the goods being appraised prior to and at the place of direct shipment to Canada are to be added to the price of the goods. Therefore, Canadian imports are valued f.o.b. (free on board), place of direct shipment to Canada. The value excludes freight and insurance costs in bringing the goods to Canada from the point of direct shipment.

To countries other than the United States, exports are, in principle, valued or recorded at the values declared on export documents, which usually reflect the transaction value, i.e., actual selling price, or in the case of a non-arm's-length transaction, the transfer price used for company accounting purposes. Canadian exports to overseas countries are valued at f.o.b. port of exit, including domestic freight charges to that point, but net of discounts and allowances. As of January 1990, Canadian exports to the United States are valued f.o.b. point of exit from Canada. Prior to 1990, they were valued f.o.b. place of lading net of freight charges, discounts and allowances.

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Mineral and Metal Commodity Reviews

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

Aluminum [1999 - 1998 -1997 - 1996 - 1995 - 1994][Related Links]
Anhydrite and Gypsum [1999 - 1998 - 1997 - 1996 - 1995 - 1994][Related Links]
Antimony [1995][Related Links]
Asbestos (Chrysotile) [1999 - 1998 - 1997 - 1996 - 1995][Related Links]

Barite [1997][Related Links]
Bismuth [1995][Related Links]

Cadmium [1995 - 1994][Related Links]
Calcium Carbonate [1995][Related Links]
Cement [1999 - 1998 - 1997 - 1996 - 1995 - 1994][Related Links]
Cesium [1995][Related Links]
Chromium [1995][Related Links]
Chrysotile (Asbestos) [1999 - 1998 - 1997 - 1996 - 1995][Related Links]
Coal [1998 - 1997 - 1996 - 1995 - 1994][Related Links]
Cobalt [1996 - 1995 - 1994][Related Links]
Columbium (Niobium) [1994][Related Links]
Copper [1999 - 1998 - 1997 - 1996 - 1995 - 1994][Related Links]

Diamonds [1999 - 1998 -1997 - 1996 - 1995 - 1994][Related Links]

Ferroalloys [Related Links]

Gemstones [Related Links]
Gold [1999 - 1998 -1997 - 1996 - 1995 - 1994][Related Links]
Granite [Refer to Stone][Related Links]
Graphite [1994][Related Links]
Gypsum and Anhydrite [1999 - 1998 - 1997 - 1996 - 1995 - 1994][Related Links]

Indium [1995][Related Links]
Iron Ore [1998 - 1997 - 1996 - 1995 - 1994][Related Links]

Lead [1997 - 1996 - 1995 - 1994][Related Links]
Lime [1999 - 1998 - 1997 - 1996 - 1995 - 1994][Related Links]
Limestone [Refer to Stone][Related Links]
Lithium [1995][Related Links]

Magnesium [1999 - 1998 - 1997 - 1996 - 1995 - 1994][Related Links]
Manganese [1994][Related Links]
Marble [Refer to Stone][Related Links]
Mercury [1999 - 1998 - 1997 - 1995][Related Links]
Mica [Related Links]
Mineral Aggregates [1999 - 1998 - 1997 - 1996 - 1995 - 1994][Related Links]
Molybdenum [1996 - 1994][Related Links]

Nickel [1999 - 1998 - 1997 - 1996 - 1995 - 1994][Related Links]

Niobium (Columbium) [1994][Related Links]

Peat [1995 - 1994][Related Links]
Phosphate [Refer to Potash][Related Links]
Platinum Group Metals [1996][Related Links]
Potash [1999 - 1998 - 1997 - 1996 - 1995 - 1994][Related Links]
Pyrophyllite and Talc [Related Links]

Rare Earth Minerals [Related Links]
Recycled Metals [1994][Related Links]

Salt [1998 - 1995 - 1994][Related Links]
Sandstone [Refer to Stone][Related Links]
Selenium and Tellurium [1995][Related Links]
Shale [Refer to Stone]
Silica [1995][Related Links]
Silicon [1995][Related Links]
Silver [1997][Related Links]
Slate [Refer to Stone][Related Links]
Stone [1999 - 1998 - 1997 - 1996 - 1995 - 1994][Related Links]
Strontium [1995][Related Links]
Sulphur [1999 - 1998 - 1997 - 1996 - 1995 - 1994][Related Links]

Talc and Pyrophyllite [Related Links]
Tantalum [1994][Related Links]
Tellurium and Selenium [1995][Related Links]
Tin [1997 - 1996 - 1995 - 1994][Related Links]
Titanium [1995][Related Links]
Tungsten [1994][Related Links]

Uranium [1999 - 1998 - 1997 - 1996 - 1995 - 1994][Related Links]

Vanadium [1994][Related Links]

Wollastonite [Related Links]

Zinc [1999 - 1998 - 1997 - 1996 - 1995 - 1994][Related Links]

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